





# The Cambrian Mining Company

(LIMITED).

CAPITAL £100,000, IN 50,000 SHARES OF £2 EACH.

## DIRECTORS.

Colonel the Hon. T. G. CHOLMONDELEY, J.P., Abbots Moss, Northwich.  
 EDWARD HILTON, Esq., Radfield, Clapham Park, S.W.  
 JAMES GRIEVES, Esq., The Paragon, Streatham.  
 GEORGE H. KEENE, Esq., Warwick Street, S.W.—MANAGING DIRECTOR.

## SOLICITOR.

HENRY WICKENS, Esq., 95, Palmerston Buildings, London, E.C.

## BANKERS.

ROBERTS, LUBBOCK, AND CO., Lombard-street, London, E.C.

## LONDON OFFICES.

48 AND 49, PALMERSTON BUILDINGS, OLD BROAD STREET, E.C.

This Company is formed to Purchase for the sum of £70,000, in Shares, the Lease, Plant, Machinery, Buildings, and other Appliances and Appurtenances of the

## ESGAIR-HIR SILVER-LEAD MINE.

AND THE

## ESGAIR-FFRAITH COPPER MINE.

These famous mines are amongst the most extensive and richest ever discovered in Wales.

The mines are now in operation.

The properties extend on the course of the lodes upwards of three miles.

The mines are amply provided with modern and powerful pumping, drawing, crushing, and dressing machinery.

Barracks are erected on the mines for the accommodation of upwards of 300 miners.

The other buildings comprise well-fitted offices, smiths' and carpenters' shops, ore-houses, stables, engine-houses, &c., &c.

The royalty is only 1-16th, and no rent.

The chief management of the mines is under the direction of Mr. Thomas Granville, M.E., late Manager of North Basset, West Basset, East Carn Brea, and other most successful mines.

The great value of these mines and the desirability of an investment in the shares of the company is shown by the following reports of practical mining engineers:—

## REPORT OF MR. JOSIAH H. HITCHINS.

This gentleman is one of the highest mining authorities, and the discoverer of the celebrated Devon Great Consols Mines, which have paid in dividends £1,192,096.

**ESGAIR-FFRAITH.**—The property comprising this mine is an unusually extensive one, being quite 1200 fms. on the course of the lode. The workings consist of an adit brought in from the side of the mountain, a level 10 fms. below, and an engine-shaft, which is 6 ft. deeper. The extent of the adit level east is 63 fms., in which the lode (to be seen throughout the drive) is 20 ft. wide, and as the north or hanging-wall of the lode has not been seen its entire width is unknown. It may be said without fear of contradiction that this great lode presents the most conclusive evidence of powerful mineral and chemical action, there being, indeed, convincing proof thereof in the fact that the back of the level (only 15 fathoms deep) has been stopped (worked) for ore in places—that is to say, at five different points, the produce being copper ore of the value of £20 a ton. Although this lode so far in Esqair-Fraith has proved no other than a copper-producing one, which it will be for the most part for a good many fathoms below the present workings (yielding such large quantities of rich ore as will ensure high percentage profits). I am of the opinion that in depth it will be a most abundantly productive lead lode; Esqair-Fraith being certain as a lead mine, in my opinion, to equal the adjoining celebrated Esqair-Hir, one of the greatest and richest of the lead mines in Wales, and on the very same lode as Esqair-Fraith, it is important to bear in mind.

The opinion just offered finds support in the fact that in the eastern portion of Esqair-Hir the lode in places was a copper-producing one. The extent of the 10 fm. level east is 17 fms., the lode being equally wide, and showing as highly promising a character as in the adit. The drive is being pushed forward with all possible force for getting far enough east to have the rich ore ground gone through in the adit, which no doubt will at this level, which is 10 fms. deeper, be found equally rich if not richer, and more regularly continuous. The level has not to be driven many fathoms further east before being in the run of the rich ore ground referred to; that this lode will not only be abundantly productive at the 10 fm. level, but more so at deeper levels, I feel fully assured, judging a good deal by the gossan holding down in it, which is very strong, presenting altogether a highly appreciable and indeed most splendid character. I have no hesitation in saying that there exists a great body of rich copper ore in this part of Esqair-Fraith, and at no much greater depth than the present workings, the superstructural portion thereof having indeed already been reached, it may be said without fear of being wrong.

With my 40 years' varied mining experience, I have no fear of being thought too pretentious in claiming to be competent to pronounce judgment on such a lode as the one in question. My knowledge of the constituent character of Cardiganshire productive lodes, and their mineralising conditions, as well as of the class of rocks they should be associated with, on which their ore products and accumulations in large bodies depend, will not allow me to form any other opinion of the Esqair-Fraith lode than it is inherently one of very great productive power, having in store at no great depth, as before intimated, such resources as will ensure very large returns of ore, both copper and lead, and the realisation of large profits.

I rest my opinion on the strong ground of analogy, to which experienced and enlightened mining authorities will ever attach the utmost importance, having found it to be their most reliable guide in judging of lodes—that is to say, whether they will prove productive or not. The extent of the 10 level west is 13 fms., in which the lode is quite as wide as in the eastern drive, and of the same highly favourable character, showing, indeed, greater mineral strength near the shaft, where it makes some good ore, so much as to be equal to about 3 tons to the fathom, which must remain for a time, it being neither convenient nor safe to take away whilst the shaft is sinking, which to continue with all possible force and dispatch is of paramount importance, it being at present only 8 ft. deeper than the 10 fm. level below the adit. The quicker the shaft is sunk the sooner will be reached the great body of rich ore that I am so certain there is below, the evidently improving character of the lode, as to be seen at the deepest point sunk, allowing of no misgiving in looking forward to the solution of this great problem.

Whilst underground I had some stones of ore broken from the lode at the very bottom of the shaft, some of them being very rich, from 15 to 20 per cent., and presenting altogether a highly promising general character—indeed, unmistakable evidence of this lode being one of very great mineral power. It is very satisfactory that this mine has at command excellent machinery, consisting of a powerful water-wheel, 42 ft. diameter and 4 ft. breast; crusher wheel, 40 ft. diameter and 4 ft. breast; good wheel (quite powerful enough) for driving dressing machinery, consisting of four double patent jiggers,

&c., all in complete working condition; wheel for drawing, 18 feet diameter and 2 ft. 6 in. breast, with drum and all requisite attachments complete, and in perfect working order. Besides the water of this mine being enough to drive all the machinery that the various purposes referred to will necessitate, it is quite equal to working such pumping machinery as will command the fully effectual development of the lode to a depth of more than 100 fms., which is, indeed, of great importance, ensuring the cheapest and most profitable prosecution possible of the mine. It is also of importance that so much has been done in opening out this great lode, thereby several years' working being saved, and an outlay of some thousands of pounds.

With respect to the driving of the present bottom level east, to open out the rich ore ground 10 fms. below the adit, and the sinking of the engine-shaft for the deeper development of the lode, I have simply to observe that such operations are very desirable; in addition to which the driving of the bottom level west towards Copper shaft, and its deeper sinking, are very recommendable, as the general character of the stuff in the surface burrow cannot but be considered by any mining man of experienced judgment to indicate with much certainty (more particularly the splendid gossan) that there are very large bodies of rich ore to be laid open in this part of Esqair-Fraith, there being plenty of spare engine-power for deeper operations, pumping and drawing purposes. The important question whether the Esqair-Fraith lode is in the right rock finds the best answer in the fact that it is in precisely the same slate formation as Esqair-Hir and many mines that have figured amongst the greatest and richest mines of Wales. On sinking the present engine-shaft—say 30 fms. more, or only 20—it will, in my opinion, reach the great body of rich ore that I again say I firmly believe there is in Esqair-Fraith; such a body of ore, indeed, as will ensure very large profits, and establish a great value for the mine. The Devon Great Consols ore formation, that increased the value of the £1 shares to £900, was met with at a less depth than 20 fathoms. I now more confidently rely on my judgment than I did when introducing those mines, as justified by 30 years' additional experience, although I said from the first that their results would be so great as would surprise the mining world; the close upon £1,200,000 dividends that they have paid being a brilliant realisation of that prediction. I again most emphatically say that I firmly believe Esqair-Fraith will also result in an exceedingly rich mine.

May 14, 1877.

J. H. HITCHINS.

## REPORTS OF MR. ABSALOM FRANCIS.

Who possesses a most intimate knowledge of Welsh Mines, and is the author of the "History of the Cardiganshire Mines."

**ESGAIR-HIR MINE.**—This property is situated about seven miles eastward from the Llanfihangel Railway Station. It contains for very nearly one mile in length one of the largest and most masterly, as well I may safely say, the richest lode ever worked in Cardiganshire, it having produced from the 20 fm. level under adit considerably more than a million sterling in value of silver-lead ore. The courses of ore throughout the vein make in solid ribs varying from 3 in. to 6 ft. wide, the lode being in places over 100 ft. in width. I have no hesitation in saying that when the lode has been properly cross-cut throughout the grant, even at the present depths, that as much ore will remain for taking away again as has been taken away. All that is wanted to make this the greatest, richest, and most durable of the mines in this county is to work the property systematically—this being the case failure is impossible, and success is a certainty. It will be necessary to describe the position of the mine, which stands on very high ground—I should say from 1000 to 1200 ft. above the sea-level—and on this high ground is the machinery.

The lodes passing through the grant go through ground that rises rapidly from the western boundary towards the different points of workings eastward, so that by starting an adit level at this point (the boundary west), where a cross-cut of about 20 fms. would cut the lode, the adit could be continued all the way to the extreme end of the workings on the course of the lode, and would gain a back of from 500 ft. to 600 ft. in driving a distance of about 400 fms., and this would unwater the deepest point in the old workings, and leave a back of more than 30 fms. of whole ground to be taken away over the adit level, calculating from the deepest point of working.

Pen-y-Bwlch shaft has reached a depth of 60 fms., and Shaft Goch has also been sunk to a depth of 30 fms. below adit, the latter being 180 fms. to the west of the former; and the late managers say—"It only now remains to cross-cut and drive on the lodes to prove their value, which, according to our opinion, a small sum will accomplish." I may say that there does not exist one single doubt on my mind that a mine of great importance, and immensely profitable, must be opened out between these two points, and this should be done whilst the adit is being driven towards it; and as this work progresses there can be but little doubt very valuable discoveries will be made

in different places, and where rich ore is found ventilating shafts should be put through to surface, both for this and for the economical working of the ground.

There is a moral certainty of opening out a mine that will last a century, and become the richest and most profitable ever developed in Cardiganshire. There are also excellent offices, smiths' and carpenters' shops, miners' barracks, and other necessary buildings erected at great cost.

In connection with the horizontal steam-engine, I may say that all the necessary pitwork is fixed and in working order to the bottom of Pen-y-Bwlch shaft and Shaft Goch. Tramroads laid throughout the mine, and, in fact, everything that is required to press on the working of the mine. There is also an excellent crushing mill, and a good dressing flooring supplied with jiggling hutchies, &c.

**ESGAIR-FFRAITH MINE.**—This mine lies to the east of Esqair-Hir, and distant from the Llanfihangel Railway Station about 8 miles. The vein is of great size, varying from 30 to 60 ft. wide, and in this pounds worth of silver-lead and copper ores. The mine is well supplied with powerful water-wheels, for the purposes of pumping, crushing, drawing, and dressing; for the latter purposes the machinery is most perfect and complete, consisting of patent jiggers, &c., of the most approved construction, and all of which could not have been erected for a less sum than £5000.

The ground from the westward, towards Esqair-Fraith, falls rapidly for nearly three-fourths of a mile, so that the machinery is fixed in a well sheltered spot, and is supplied with water at all seasons of the year.

Although immense quantities of ore have been returned from the mine, the deepest of the workings have only reached a point of 10 fms. under the adit level, the component parts of the lode being a very rich gossan, with carbonate of lime, and a very rich copper ore, peacock, and yellow or copper pyrites, and which have been sold for as much as £25 10s. per ton. That this great gossan rises, or covers an immense mass or body of lead ore I have no doubt whatever, but there is little doubt on my mind that before the copper gives way to lead ore tens of thousands of tons of the former will be raised, and that the copper will gradually subside and be taken place by the lead, as is the case in the deepest mines of Cornwall—they making copper near the surface, which gives way to tin ore in depth. As there is a splendid field of machinery on the mine already for its immediate development, with rich copper ground to start the sinking of the present engine-shaft on, and to lay open ground enough to bring the mine into a state of good returns and profits, I would, therefore, advise the carrying out of the following work:—

To sink the engine-shaft from the 10 to the 20 fm. level, leaving a clear back of 10 fms.—	say 11 fms.—	at £30 per fathom, including costs and materials of all kinds, or.....	£ 330
Drive the 10 fm. level west 50 fms., at £10 .....	500		
" 10 " east 50 " .....	500		
" 20 " west 30 " .....	300		
" 20 " east 30 " .....	300		
Sink a winze under the 10 west to 20, 11 fms., at £12 .....	132		
east " 11 " .....	132		
Sink shaft from 20 to 30, 11 fms., at £30 .....	330		
Total .....	£2664		

I believe this work would lay open a sufficient quantity of ore to commence returns of £1000 per month, and which, I believe, would go on increasing from year to year. It is impossible to select a finer property for investment.

## REPORT BY CAPT. JOHN HUGHES.

## ESGAIR-HIR SILVER-LEAD MINE.

I was captain of this mine for two years, during which time we worked at a profit of upwards £1000 per month. The lode is one of the strongest and finest ever discovered. It runs east and west, and underlies north. The enormous size of the lode may be imagined when I state that in some places it opens out to a width of 30 yards. I have from this lode cut steel-grained silver-lead 4 feet wide solid.

I have seen most of the mines in Cardiganshire, but nothing equal to Esqair-Hir.

I have a very high opinion of the bog in front of the mine barracks, and I am aware that the ore dips towards that swampy spot. I would advise the sinking of Shaft Goch 10 fms., and then drive a level east and west; also make a communication between this shaft and the Blue shaft. If this is done it will open exceedingly rich courses of ore. From the adit level down to the 30 fm. level there is not the least doubt but that there are some thousands of tons of silver-lead standing in the shafts. I feel sure that a new adit level from the western boundary to the Blue shaft would open the mine richer than ever, and would also make it a lasting success.

April 23, 1877.

JOHN HUGHES.

## REPORT BY CAPT. HENRY BOUNDY

## ESGAIR-FFRAITH COPPER MINE

I have known this mine for the last 20 years, and had the sole underground management for five years. I shall in this report confine myself to the eastern part, for two reasons—I believe it to be the most important part of the extensive sett, and it is the part that is now being operated upon. The eastern shaft is sunk from surface a distance of 25 fms. At 15 fms. from surface an adit level is extended east 62 fms., in the driving of which we met with five immensely rich courses of copper ore. The richness of these courses of ore may be understood from the fact of our extracting it in masses of upwards of 1 ton at a time. The average value of this ore was £20 per ton.

From the adit the shaft is sunk a further distance of 10 fms., or 25 fms. from surface, and a level east was commenced, but not driven sufficiently far to cut into the courses of ore met with in the adit above. The present operations will achieve this object, and will, I do not hesitate to say, result in enormous profits. I consider you are acting wisely in sinking the shaft deeper, and then to drive east and west. There cannot be the least doubt that the deeper this lode is opened up the richer the copper will be found. I have never seen such a strong copper lode, or one so beautifully composed—in fact, the lode is so great that when explored to a greater depth it is impossible to place a limit to its value.

April 23, 1877.

HENRY BOUNDY.

The dates and names of the parties to the contracts entered into, as required by the Joint-Stock Companies Acts to be specified, are an Indenture of Assignment bearing date the 19th day of March, 1877, made between Griffiths Williams and Evan Jones Williams of the one part, and Thomas Hine Green of the other part; and a contract bearing date the 16th day of May, 1877, between the said Thomas Hine Green of the one part, and the said Cambrian Mining Company (Limited) of the other part, and an Indenture of Assignment bearing date the 18th day of May, 1877, between the said Thomas Hine Green of the one part, and the said company of the other part.

## FORM OF APPLICATION.

To the Directors of the

CAMBRIAN MINING COMPANY (LIMITED).

GENTLEMEN,—Please allot me shares of the CAMBRIAN MINING COMPANY (Limited), at £2 per share, fully paid, for which I enclose cheque value £ .....

Name in full .....

Address .....

Date .....

Occupation, if any .....

This form, when filled up, to be forwarded to Mr. G. H. KEENE, Managing Director, 48 and 49, Palmerston Buildings, London, E.C.



MAY 26. 1877.]

## Lectures on Practical Mining in Germany.

CLAUSTHAL MINING SCHOOL NOTES—No. XXVI.\*

BY J. CLARK JEFFERSON, A.R.S.M., WH. SC.,  
Certificated Mining Engineer.(Formerly Student at the Royal Bergakademie, Clausthal).  
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## SECTION II.

## PROSPECTING FOR MINERALS—BORING.

## III.—THE BORING OPERATION.

## REMOVAL OF HINDRANCES WHICH OCCUR OR ORIGINATE DURING THE BORING.

The spiral grapple, or spiral scraper, may be either single or double. It consists of a spiral, which is formed at the end of a square shaft. The section of the portion formed into a spiral is, however, a triangle, with one edge turned inwards, whilst the outside is completely cylindrical. When double—that is with a right and a left handed spiral—it is generally used for recovering broken rods. The inner edge, which is of steel, should be well hardened, and sets either when used for recovering ropes or broken rods as a long nut with open threads. The sharp edge will cut for itself screw notches on the edges of the broken rod, and thus fasten the latter firmly enough to allow of its being drawn to the surface.

The nut grapple, or grappelling nut, was devised by the Swedish miner Mat. Friewald, and consists of a conical shaped nut of steel, the mean diameter of which is equal to the diagonal across a section of the broken rod. It is used for recovering rods which have been broken between two joints, and remain standing nearly vertical in the bore hole. In such a case, after greasing the nut well with fat, it is slowly lowered into the bore hole, and over the end of the broken rod. When the foreman has succeeded in passing it over, and it is in contact with the broken end, it is very slowly lowered, and rotated at the same time, so that the screw cuts into the edges of the rod, and lays fast hold of it, so that it can be drawn to the surface.

If the broken rods are leaning against the sides of the bore hole, so that it is difficult to get the broken end within the conical nut, then a funnel-shaped sheet of iron is often fixed to the nut, the lower end of which has a diameter very little less than that of the bore hole, and is so cut that the opening is inclined to the axis. With this addition it is comparatively easy to seek for the broken end, and guide it into the nut. With such a funnel, especially if cut horizontally at the bottom, any small object which may have fallen to the bottom of the hole may be easily raised, by first filling the funnel tightly with well puddled clay, so that when the instrument is lowered to the article to be raised the latter sticks to the clay in which it is thus imbedded, and is raised along with it to the surface. The same means may be adopted for obtaining an impression of any breakage which has occurred, and this will give one an exact idea of the position in which the rods may be resting.

When by any inadvertence the rods have become unscrewed, to recover those still remaining in the bore hole all that is necessary is to fix a small funnel to any of the change rods, and lower it into the bore hole.

The claw grapple, or claw grip, sometimes also called the double finger hook, or grip, is used for raising broken rods, where the breakage has occurred just above the collar or joint. In using it it is lowered carefully into the hole, in such a manner that the curved edges glide along the side of the bore hole opposite to that on which the broken end rests; in this manner the broken end cannot be passed without perceiving it. When the broken end is met with the grip is pushed beneath the joint, or collar, and with a few trials the joint can be caught by the two hooks, or claws, and thus raised to the surface. In a, perhaps, better arrangement the claws are made slightly diverging, which allows of the rod being better caught.

The spring trap, or spring grapple, the catch spring, and the flap grapple are three instruments used in a similar manner to the claw grip. The first of these, the spring grapple, consists essentially of four long flat springs, welded together at the top to a short square rod, provided with a collar and screw. At the lower extremity the flat springs have a projection on the inside: these projections catch against the collar on the broken rods. The second of these, the catch spring, consists of a short slightly conical tube, which is joined at the upper part to the forked end of one of the grappelling rods. At the bottom end of the tube three or four short flat springs are rivetted, which project inwards, and catch beneath the collar of the broken rods. The tube is open both at the top and bottom. The last of these, the flap grapple, consists of a long fork, to the end of which a short (3 inches long) conical or cylindrical tube is fastened, and at the top of this tube two small semicircular shutters, with a square or rectangular opening in the middle, are hinged to the two ends of the fork. The opening is somewhat larger than the section of the rod, but smaller than the joint or collar. The shutters can only lift upwards, so that when the instrument has been passed over the broken end of the rods the shutters lift up, and allow the joint to pass upwards, but as soon as the joint, or collar, has passed they fall down, preventing the collar, or joint, from passing out, so that on raising this instrument to the surface the broken rods are also raised.

The spider box is intended for raising small broken pieces of iron or steel from the bottom of the bore hole. This instrument was devised in 1842 by Herr Bohrmaster Ebert, of Salz, in Prussia. It consists of a hollow cylinder of sheet-iron, about 15 in. long, open at the top and bottom. It is fastened at the top to a forked rod, but round the periphery at the bottom are fastened a great number of very flexible strips of sheet iron, which are all bent downwards and inwards towards the centre, something after the manner of a spider's leg. Now, when the spider box is lowered to the bottom of a bore hole (in which there is, say, a broken screw and collar from one of the rods), and then forced against the bottom, the strips will be bent still further inwards, and beneath the broken screw, forming a network at the bottom through which the broken screw cannot slip, and which can now be raised along with the spider box to the surface.

In order to raise small pieces from the bottom of the bore hole, Herr Kind devised the instrument called the catch clutch. It consists of a spindle about 3 ft. long, and which has a screw formed on it in the middle for about one-third of its length. The upper end has a collar and a short screw, by which it is attached to the grappelling rods. The lower end carries a ring attached by three arms, and the ring is notched on the inside in three places. A small disc, having a nut at its centre, which fits on the screwed part of the spindle, carries three catch levers, or arms, which are hinged in the disc, the lower ends of the arms sliding in the notches in the ring. When the instrument is at the bottom of the bore hole the spindle is rotated, which forces the ends of the arms nearer together, and so lays fast hold of any object lying at the bottom of the bore hole.

The next two instruments we shall describe are used for extracting the sludger from the bottom of the bore hole. The first of these instruments is used for extracting the sludger when the forked rod to which the sludger tube is rivetted is broken. It consists of a square rod, the upper end terminating in a collar and screw, by which it is attached to the grappelling rods, the lower part being fitted to a conical or tapering end. At the lower part four flat springs, which project upwards and outwards are welded, one pair being somewhat higher than the other. The lower pointed end easily follows of the instrument being pushed down into the top of the sludger, and on the instrument being forced still further down, the four flat springs are also forced inside the sludger. These springs, which are made sufficiently stiff for the purpose, press against the inside of the sludger, so that on drawing up the instrument the sludger is also raised to the surface.

The sludger hook is made single or double, and is used when the strap to which the sludger is rivetted is not broken. When double the instrument greatly resembles a harpoon.

*Mode of proceeding when a Breakage has occurred.*—The breakages most usually occur to the boring apparatus are those of the screwed ends of the rods and the boring tool (borer) at the bottom of the bore hole. Breakages of the falling piece of the free falling apparatus, or of the apparatus itself, are less seldom, but the most difficult to remedy. The breakages of the borer occur, as has been remarked, on the shaft of the borer just above the collar, and we have mentioned one of the remedies in Lecture XXI. Another is to make the socket and the end of the borer conical, and without being screwed.

When a breakage of the borer has occurred it will generally, with careful attention, be perceived by the man at the hand brace, since there will be no side friction to be overcome, and the rods will, therefore, rise and fall more easily, and the rotating of the rods also will be effected with the application of a much less force; indeed, if the rods have any twist at the moment the breakage occurs they may move round of themselves. But it is also evident that the same symptoms would occur if the screw joint had merely become loose. In any case, however, it is better to cease boring at once, and to raise the rods to the surface.

The recovery of the borer will be best effected by means of the finger grip, or gripping jaws, and it is evident that a long borer, which must rest in a more vertical position, will be more readily recovered than a short one. If the breakage has occurred at one of the junctions of the rod, just above the collar, then the finger grip will be the most suitable instrument to use, though the grappelling shears, or the claw grip, &c., may render useful service. If the breakage occurs in the middle of a rod, then it will be dangerous attempting to raise it by laying hold of it below the next joint, since the broken rod above would be liable to catch against and dig into the side of the bore hole, and if force were used it would most probably become bent; in any case a jamming fast in the bore hole would be very likely to occur. It will be best to endeavour first to unscrew the broken rod by means of the wolf's jaws, the spiral scraper, or the grappelling nut, and after the broken rod has been raised to the surface to endeavour to raise the remainder by means of the finger grip, with which more force can be safely used than with the other instruments.

If the breakage has occurred in several places, as was often the case with the old system with rigid rods without a free falling apparatus, then the endeavour to raise them should always commence with the uppermost, since any other order would most likely increase the difficulties by causing a wedging fast of the upper portions in the bore hole. The breakages which happen to the sludging apparatus are usually those of the rope, or the apparatus suspended from it—the sludger itself, or the connecting rods.

If during the sludging operations the sludger becomes wedged fast at the bottom of the hole, so that an attempt to raise it by means of the rope would be likely to end in a breakage of the latter, then it will be better to lower the finger grip, and endeavour to catch the rods interposed between the rope and sludger beneath one of the joints, or collars; or where no rods are interposed to lower the sludger hook, and with it lay hold of the sludger strap, or to lower the spring catch. It need hardly be mentioned that the rope should be wound in at the same time the grappelling rods are being raised.

If the rope breaks immediately above the sludger (or rods, if rods are interposed) then it is wound empty on to the drum, and the spring catch or sludger hook, or in the latter case the finger grip, or the gripping jaws, are lowered and used for recovering the sludger. The most dangerous breakage is when the rope breaks pretty high up in the bore hole, and falling down stops it up. In such a case a finger grip, with the end turned upwards, or the double spiral scraper may be used. Great difficulty is sometimes experienced in raising a broken rope, from the fact that the rope gets entangled, and forms large knots or balls, which sometimes require cutting or boring in pieces before the rope can be raised. When a wire-rope is used the danger of the rope breaking is very small, and when a breakage does occur it offers no great difficulty to its recovery by means of the finger grip or the spiral scraper. Cases may occur in which small portions of the apparatus, as screws, nuts, or rings, &c., may break off and fall to the bottom of the bore hole, and may defy all attempts to lay hold of them. In such a case, but only when all other means have failed, it is usual to attempt either to cut or break the piece in question into smaller pieces, or to force the piece sideways into the rock itself. Even with larger pieces, such as screw keys, the same remedy has been successfully tried. If the stratum is soft there may not be much difficulty in forcing the piece sideways out of the line of the bore hole, but unless the hole is soon afterwards lined the risk will always remain of the piece becoming loose and falling down into the hole again during the further boring, which might readily lead to a more serious breakage.

*The Lining of Bore holes.*—In prospecting for minerals, as well as in the sinking of saline, mineral, or artesian wells, it not unfrequently occurs that the stratum which has to be bored through is either so mild that when it is penetrated by water it is softened to such an extent that it may give way and fall into the bore hole, or that the stratum consists in places of a loose conglomerate, or a quick sand, or other quick strata, which would prevent any further progress of the boring, or give rise to dangerous enlargements. In such cases it will be necessary to line the bore hole at that part, or it may be deemed advisable to line it throughout its whole extent. In the sinking of bore holes for mineral or saline wells it will be necessary to line the bore hole to keep out the surface water. German miners are accustomed to distinguish three methods of lining the bore hole.

1.—The simplest and cheapest manner of keeping back any quick ground which is met with when sinking a bore hole is simply to line that particular part, and then to continue the bore hole of a diameter equal to the inside diameter of the lining. The lining should extend 6 ft. above and below the quick strata, and the ledges on which the lining rests should project  $\frac{1}{2}$  in. or  $\frac{3}{4}$  in. within the lining, so that the continuation of the bore hole will really be from  $\frac{3}{4}$  to 1 in. less in diameter than the inside diameter of the lining. It may, however, be readily supposed that such quick strata may occur in several places, and as each successive lining must be made sufficiently narrow to pass within the upper ones, then if the bore hole be not of sufficiently large dimensions to commence with it will soon become too narrow for further boring, and the boring may have to be given up without having answered its purpose. This sort of lining is called by the Germans "lost lining."

2.—The lining may be carried down from the surface to some distance below the loose or quick strata, and the bore hole continued with a diameter a very little smaller than the inside of the lining. If a second quick stratum is met with either one can extract the old lining, and then enlarge the lower part of the bore hole to the original diameter, and lengthen the old lining and re-insert it; or if the old lining cannot be extracted without risk, then a narrower lining may be inserted within the first, which shall likewise reach to the surface, and the bore hole may be continued with the narrowed dimensions. The second lining is often made to cover only the quick ground through which the bore hole passes. It will be evident that if a third portion of quick ground is met with, and the second lining cannot be withdrawn, then a third lining will be required, and the bore hole must be continued of a still narrower diameter. In this case the object to be attained is the same as in the first—simply to shut off the loose quick strata from the bore hole, and is called shutting off or covering lining.

3.—The bore hole may be bored out beneath the old lining of the original diameter, and the lining gradually lengthened at the surface, and made to follow within a few feet of the bottom of the bore hole. In this last case the object is generally the shutting out of all surface and other water, except what is obtained at the bottom of the bore hole, such lining being called isolating lining.

We have previously mentioned that the keeping back of quick ground, &c., could be effected by filling the bottom of the bore hole with well puddled clay or hydraulic cement, and after this has sufficiently hardened to bore through the filling again, but this should always be regarded as a mere temporary device, to be followed by the lining of the bore hole either at that place or throughout its whole extent. As we have mentioned, the object of the lining is to prevent a falling in and enlargement of any part of the bore hole, or

the making water tight of the whole down to a certain depth. In the latter case we shall call the lining tubes water-tight tubes, and in the first case shall simply use the common term lining tubes.

The tubes are made of cast or sheet iron, of wood, of sheet copper, of sheet brass, and sometimes of sheet zinc. The sheet-iron tubes are often galvanised. Sheet iron is decidedly the best in most cases, both on account of its strength and comparative cheapness, but when saline or acid waters are met with it may become necessary to use copper or brass in consequence of the corrosive action of such waters on iron.

The operation of lining of a bore hole consists in lowering a succession of tubes, which it is evident cannot be accomplished by first fixing the whole set of tubes together, but only two or three at a time to form a set, and then attaching each set to the projecting end of the previous set, which has already been inserted in the bore hole. It will also be evident that the longer each separate tube can be made the less will be the number of joinings to each set, or that the number of the sets may be diminished, so that the lowering of the tubes will proceed more rapidly. The usual length of the sheets from which the tubes are made is about 6 ft., and the breadth will evidently depend upon the diameter of the bore hole. The thickness is also dependant on the diameter, or on the length to which it is intended that the lining shall extend. When the diameter is less than 8 in., 3-32 in. to  $\frac{1}{4}$  in. will be amply sufficient, and for a greater diameter the thickness may increase to 7-32 in. In the boring trials at Schöningen 1-10 in. was found to be too weak. The sheet-iron should be of the best quality, and soft enough to allow it to be bent in a cold state to the required diameter.

The lining tubes are made in three different ways, either each single tube is completely cylindrical, and where two are joined together they meet flush, and are surrounded by a short muff, or they are formed conical, so that the narrow end of one just fits into the wide end of the next, by which it must be observed that all the wide ends are of the same size, and likewise all the narrower ends; or, lastly, they are made double, in which case the joints of the inner set of tubes and those of the outer sets alternate. The muff used for cylindrical tubes which meet flush is generally from 6 to 9 in. deep, the lower half of the muff being rivetted on to the top of the next lowest tube, and the lower end of the upper tube is then inserted inside the top half of the muff until the lower end fits close against the top of the lower tube when it is rivetted to the top half of the muff. In the boring trials at Artern the muff is screwed on to the top of the lower tube, the bottom of the next tube above being screwed into the muff, and the joint was made tighter still by soldering it with a mixture of two parts of tin and one of lead. When rivets are used they generally have the holes countersunk on the outside. The projecting edges of the muff renders the lowering of the lining more liable to be stopped, as they might easily catch against the sides. The longitudinal lap generally amounts to 1  $\frac{1}{2}$  in. The rivets used are usually from  $\frac{1}{4}$  in. to  $\frac{3}{4}$  in. in diameter. In this country there will be no difficulty in obtaining such tubes ready made, so that the mode of manufacturing them hardly requires here mentioning. The connecting of several of these tubes to form a set, and the joining of the sets together, as they are performed on the spot, may be special, so that we shall proceed to describe them.

The length of a set of lining tubes depends, like the length of a set of boring rods, on the available space between the top of the guiding bore-tube and the winding pulley. The rivetting of the tubes together takes place on a long wooden mandrel, on which a round iron plate is fastened as anvil. The mandrel is supported on two blocks of wood, and the one end must project 6 in. more than the length of the tube, and supposing the tube to be 6 ft. long then the mandrel must project 6 ft. 6 in. The rivet holes must be made with a breast borer over the wooden mandrel, where a lead plate has been attached. The conical tubes, which are always to be preferred to the flush-jointed tubes with an outside muff, are as has been remarked so attached to each other that the narrow end of one fits into the broad end of the adjoining one, the overlap being from  $\frac{3}{4}$  to 4 in., and the two are made fast by a double set of rivets. The tubes are so made that the two ends fit tightly into one another, the overlap of each tube is as it were but a prolongation of the previous one, so that when completed the longitudinal overlap forms a long spiral round the tube. The muff round the cylindrical tubes is generally from 6 to 8 in. long, one half covering the one tube and the other half the other tube, the tubes themselves fitting flush against each other within the muff. The longitudinal joint of the tubes, as in the bore-hole at Elmen, in Prussia, is sometimes made flush, a long narrow strip passing over the joints inside the tube. At Elmen the tubes were 6 ft. long, 12  $\frac{1}{2}$  in. inside diameter, the sheet-iron  $\frac{3}{4}$  in. thick, the muffs were 8 in. long and 12  $\frac{1}{2}$  in. outside diameter.

Messrs. Mather and Platt, of Manchester, make their tubes of cast-iron all 9 ft. long, and  $\frac{3}{4}$  in. in thickness, according to the diameter of the tube. The successive lengths are connected together by means of wrought-iron covering hoops or muffs, 9 in. long, of the same diameter outside as the diameter of the tube, so as to be flush with it, the thickness varying between  $\frac{1}{4}$  inch to  $\frac{3}{4}$  inch. The ends of each tube are reduced in diameter by being turned down for  $\frac{1}{2}$  in., so as to fit the inside of the muffs exactly. Four or six rows of screws, with countersunk heads, are screwed through the muffs into the tube, to couple the two lengths securely together. The joint is thus flush both on the inside and outside of the tube. The lowest tube is provided at the bottom with a sharpened steel shoe, which is partly shrunk on, and further secured with screws, the extreme end of the tube being turned somewhat less in diameter, so that the connection is perfectly flush.

The breadth of the piece of sheet-iron out of which the linings are made depends of course on the diameter of the bore hole. When the tubes are conical, so that the narrow end of the one is inserted in the broad end of the other, the sheet of iron of which a single tube is made is not a rectangle but a trapezium, the lower end being narrower than the upper. As the diameter of the upper end depends on that of the lower end, which must fit closely inside it, it will be necessary to calculate the smaller diameter first.

The double tubes used at Artern were 3 ft. long and 1-16th in. thick, of sheet-iron. The exterior tubes, which formed really a series of long muffs over the joints of the inner tubes, were 3 in. exterior and 3-15th in. interior diameter; the inner tubes were 3 in. in exterior and 2  $\frac{1}{2}$  in. in interior diameter, so that there remained a space 1-16th in. wide between the two sets of tubes. The longitudinal lap of the tubes was 1 in., and there were 28 rivets in the length of 3 ft. The separate tubes were placed in a bath of dilute sulphuric acid (one part of sulphuric acid of 1-85 sp. gr. and three parts of water) for 12 hours, and, after washing with clear water, were scoured with sand, and then tinned. The plating bath had an addition of one-third of lead, the bath being melted under a cover of tallow. The exterior tubes were plated with tin on both sides, the inner tubes on the outside only. The tubes were fixed together vertically, and the space between two tubes was filled up by pouring in a molten alloy of equal parts of tin and lead, or of one of tin and two of lead. It must be remembered that these tubes are used not only as a lining to protect and preserve the sides of the bore hole, but also to form a supply pipe which should be water-tight and resist corrosion, otherwise double tubes are too expensive.

*MANUFACTURE OF ARTIFICIAL STONE.*—The invention of Mr. L. L. LEATHERS, of Oakland, California, consists of a process for making a saponaceous solution for tamping the compounding materials; and, secondly, in a novel combination of materials for compounding and producing an artificial stone. Hard wood ashes and water are used to make a weak lye, and oily or resinous substances added to make a saponaceous solution. A small quantity of alum is dissolved in cold water and added to the above solution, which is then complete for moistening the sand and cement. To make his artificial stone he first makes a saponaceous solution or compound in the following manner, but he wishes it to be understood that he does not confine himself to the exact proportions, as they may be varied. To 10 lbs. of hard wood ashes he adds eight gallons of water, and boils them together so as to produce a weak lye. To this lye he then adds 8 lbs. of some fatty, oily, or resinous substance, and

\* Being Notes on a Course of Lectures on Mining, delivered by Herr Bergstrath, Dr. von Grottebeck, Director of the Royal Bergakademie, Clausthal, The Harz, North Germany.



boils moderately for eight hours, occasionally adding a small quantity of water so as to preserve a uniform quantity of eight gallons and prevent concentration; he then adds eight gallons of hot water and boils for half an hour longer, when he strains the liquid off through a fine sieve into another vessel, allows it to cool, and then closes tightly for use. For a fatty substance he prefers to use lard, as it has given him the best result; but any of the oily or fatty substances used in the manufacture of soaps can be used; he then dissolves 1 lb. of alum and 28 gallons of clear cold water, and adds two gallons of the above-described saponaceous liquid and thoroughly mixes them by stirring. Having thoroughly mixed four parts of clean sharp sand or sand and gravel with one part of good cement while dry, he then adds a sufficient quantity of the solution to dampen it so that it can be properly tamped in the usual way. He is thus able to produce an artificial stone of great durability and hardness at a very slight expense for material.

#### GEOLOGICAL SOCIETY OF LONDON.

May 9.—Prof. P. MARTIN DUNCAN, M.B., F.R.S. (President), in the chair.

James Dorrington, Orphan Asylum, Wolverhampton; Rev. E. R. Lewis, Protestant Syrian College, Beirut, Syria; Edward Penton, jun., Charlotte-street, Fitzroy-square; Henry Rosales, mining engineer, Ballarat, Victoria, Australia; and Henry White, F.S.A., Queen's Gate, Hyde Park, were elected Fellows of the Society. The Rev. Charles Leach, Vincent-street, Birmingham; William May, Orpington House, Kent; John W. Myers, Westbury-road, Westbourne-square; and J. Fletcher Pagen, mining engineer, Chapel Heys, Bodmin, Cornwall, were proposed as Fellows of the Society. Richard Geo. Coke, civil and mining engineer, Tapton Grove, Chesterfield; Robert Slater, Lansdowne-place, Blackheath; and William Swanston, King's-street, Belfast, will be balloted for as Fellows of the Society. The following papers were read:—

- 1.—"On the Agassizian genera *Amblypterus*, *Palaoniscus*, *Gyropterus*, and *Pogonopterus*." By Ramsay H. Traquair, M.D., F.R.S.E., &c.
  - 2.—"On the Cretaceous Verrucosa, Fractification, and Varieties of *Sphenopteris affinis*, and on *Staphylopteris? Peachii*, Etheridge and Balfour, a genus of Plants new to British Rocks." By C. W. Peach, A.L.S. Communicated by Robert Etheridge, F.R.S., V.G.P.S.
  - 3.—"On the occurrence of a Macrurus Decapod (*Anthracopoda Woodwardii*, sp. nov.) in the Red Sandstone, or Lowest Group of the Carboniferous Formation in the South-East of Scotland." By Robert Etheridge, jun., F.G.S.
  - 4.—"On the Stratigraphical position of the Corals of the Lias of the Midland and Western Counties of England and of South Wales." By R. F. Tomes. Communicated by R. Etheridge, F.R.S., V.P.G.S.
- The next meeting will be held on May 23, when the following communications will be read:—"Remarks on the Coal-bearing Deposits near Ereiki, the ancient Heraclea, Pontus Bithyniae." By Rear-Admiral T. A. B. Spratt, C.B., F.R.S., F.G.S.—"On the Structure and Affinities of the genus *Siphonia*." By W. J. Sollas, Esq., B.A., F.G.S.—"On the Serpentine and associated rocks of the Lizard District." By the Rev. T. G. Bonner, M.A., F.G.S.—"On certain ancient Devonian Pitchstones and Perlitites from the Lower Silurian District of Shropshire." By S. Allport, Esq., F.G.S.

**ROYAL CORNWALL POLYTECHNIC SOCIETY.**—The forty-fourth annual report of this society, for 1876, has just been issued.—(Falmouth: Lake and Co., and R. C. Richards)—and although the balance at the bankers is reduced by about 50L, this reduction is fully accounted for by the extra cost—62L against 15L—for printing and engraving the report and other exceptional expenditure. These facts afford an opportunity of referring to the objectionable practice of authors supplying heavily illustrated papers, especially as it too often happens that those doing so merely furnish their productions to the Society because they are so worthless that they could never be got into print without pecuniary loss to the writers by any other means. Even in the present report the whole of the illustrations could well have been dispensed with, since they accompany papers which are virtually prospectuses of the several manufacturers, and give no information which would assist the practical man in determining whether the invention is worthy of adoption that would not have been obtainable from the papers without the accompanying woodcuts. The volume contains excellent abstracts of the lectures on Modern Pottery, by Mr. R. N. Worth; and on Japanese Antiquities, by Mr. W. C. Blaise; and good descriptions of the more important machines and apparatus exhibited at the annual meeting. The report, price 2s. 2d., including postage, can be had from our office.

**MINERS' ASSOCIATION OF CORNWALL AND DEVON.**—The Reports and Proceedings for 1876 have just been issued.—(Falmouth: Lake and Co.)—and it is gratifying to find that the expenditure for the year has only exceeded the receipts by 4L. 6s. 4d., so that it may be hoped that in future years the balance will be on the right side. The Association appears to be doing good work, since the students make an excellent figure at the examinations of the Science and Art Department. All who passed "first advanced" in Mineralogy; two out of the five "first advanced," and all the "first elementary" in Principles of Mining; and of Queen's medals the only one awarded for Mineralogy, one of the two for Steam, and one of the four for Inorganic Chemistry were also gained by students in the classes of the Association. The papers contained in the volume, which can be had from our office (price 1s. 7d., including postage), include description of the Barrow Rock Drill, as worked at Dicoath Mine by Capt. Josiah Thomas; Taylor's Drum Dressing Machine; on the Himmelfahrt Mine, Freiberg, Saxony, by Joseph Garland, F.G.S.; on Curtis's Pulveriser, by Capt. S. Bennetts; on Oxlard and Hocking's Calciner, by Dr. Oxlard, F.C.S.; on the Application of Labour in Cornish Mining, by Messrs. John and Nicholas Bryant, of Londen-derry, Nova Scotia; and on the Saline Works at Halle, by Joseph Garland, F.G.S. There are also condensed reports of the district meetings of the Association, so that much information may be gained from the perusal of the book.

**RUSSIA FINANCIALLY CONSIDERED.**—The statements that it is by a financial standard alone that we can judge of the importance of Russia's place amongst the great Powers of Europe, and that the weakness of her treasury, while fortunately for the peace of the rest of Europe, preventing her aggressive propensities, will, if those passions be indulged against the dictates of prudence, ultimately cause her downfall, can scarcely be questioned; but if any proof of their accuracy were wanted the concise and interesting little pamphlet bearing the above title, by E. C. MADDISON, of Walbrook, just issued through Mr. Effingham Wilson, of the Royal Exchange, would afford it. He points out that in Russia the grand item of expenditure since the days of Peter the Great has been for the maintenance of an immense army. The key of the mighty position for which Russia is contending is Constantinople, and the conquest of that position by Russia, it is plain to all minds, would mean the inevitable extension of her sway over Asia Minor, which would shake our Indian Empire to its foundations. The Russian Empire has almost staked its existence on the present war, but it has engaged therein without counting the cost, and it is all but certain that its already overstrained finances will not support the additional burden. Capitalists are very wisely cautioned not to invest in Russian securities, and the reasons given are sound and unanswerable. The Russian currency rouble, whose par value is 3s. 4d., is now exchangeable at 25d. only, and the issue of more paper money would send it still lower. An income of 12L. 5s. per annum is considered good for a peasant family of five persons, and of this 2L. 5s. has to be paid as taxes. The mainstay of the Russian revenue is the 25,000,000 of the excise duty on spirits, and the poll-tax and land tax yield 15,000,000. The revenue is quite inelastic. Of the 77,000,000 of the Czar's subjects, 64,000,000 are drunken peasants; 1,000,000 nobles, 7,000,000 priests and monks, and 4,760,000 soldiers. Mr. Maddison shows that the trade prospects of Russia are constantly becoming more gloomy, owing to the increasing competition of the freest and most energetic races of the world. Russia appears to be getting financially weaker and weaker, and the budget deficit of the last 10 years, which does not include the period affected by the Crimean war, is over 10,500,000. Having dissected the figures

of the reports and estimates published by Russia, Mr. Maddison very fairly concludes that it will be patent to everyone that her financial position is in the last degree critical; the manner in which private loans have recently been contracted to enable Russia to meet her engagements is pointed out, and it is shown that a few months war will render her absolutely bankrupt. Investors and capitalists cannot do better than read the pamphlet carefully and thoughtfully.

#### PROMOTERS, AND SHAREHOLDERS.

Although it is essential in the interest of industrial progress to protect those connecting themselves with joint stock companies as subscribers for shares against any fraud or deception on the part of those engaged in the establishment of such companies, it is altogether unreasonable to suppose that any sane individual would undertake the formation of a company for the sole benefit of capitalists who might choose to become shareholders, and without consideration of realising a profit for himself. This being the case, the "Observations on the Object and Effect of Section 38 of the Companies Act, 1867," by a Solicitor (London: Stevens and Sons, Chancery-lane), is worthy of the thoughtful consideration of every investor. It will be remembered that the clause in question is that which requires that every prospectus shall disclose the names of the parties to any contract entered into by the company, or by the promoters, directors, or trustees, and, whether subject to adoption by the directors or the company or otherwise, the absence of disclosure being deemed fraudulent. Now, the common sense interpretation of the clause has been almost without exception held to be that the contracts referred to are all contracts which if subsequently brought forward would make the company's position worse, and it has further been held that the object of the provision "whether subject to adoption by the directors or the company or otherwise" was to prevent the subsequent illicit confirmation of contracts which it was undesirable to disclose in the prospectus. But legal knowledge is frequently capable of ignoring common sense, and the arguments of "A Solicitor" show that of this the interpretation of the 38th clause affords an instance.

The views of "A Solicitor" appear to be both just and reasonable, and they are certainly calculated if legally confirmed to restore the enterprise of promoters, without whose aid the establishment of public companies is practically impossible, whilst no injury will be inflicted upon investors, who should at least be expected to accept the same risks as other men of business when concluding an ordinary business arrangement. A merchant buying a commodity with which he was unacquainted would be deemed insane if he paid for it without enquiring whether the commodity was useless or useful, or what was the market value; yet investors make no such enquiries either as to what they are purchasing or the commercial probabilities of profit from the development of the enterprise embarked in. As a matter of fact, they look for their profit in another direction, and are really even more dishonest than the most questionable promoters; they too frequently subscribe with the fraudulent intention of reselling the shares at a premium to those with less knowledge than themselves, and their usual enquiry is not whether the enterprise possesses the elements of success and profit, but whether the shares are likely to go to a premium, so that they can "let them slide," as the priest did the counterfeit halfcrown, for their own advantage. As the object of "A Solicitor" has been to comply with the requirements of the law and not to evade the results of non-compliance his opinions are the more acceptable. It is submitted, and with the utmost confidence, the contracts required to be specified are those, and those only, which impose an obligation binding on or intended to be performed by the company; and that the statute does not apply, and was never intended to apply, to contracts, whether honest or otherwise, by which persons concerned in getting up a company derive personal advantages from the operation. If such collateral contracts are honest there is no just ground for compelling their disclosure under a heavy penalty; if dishonest the law as existing previous to 1867 was, and still remains, perfectly able to afford redress. There is, therefore, no reason for straining the enactment in question, so as to make it include cases to which it was never intended to apply.

Now, those who are practically conversant with the history of modern joint-stock companies know perfectly well that in many cases the company immediately after its formation, or its directors or promoters beforehand, entered into contracts which either were binding on the company or were eventually to become so, either with or without the formality of subsequent adoption. These contracts were often made for the individual benefit of promoters and others, and were sometimes of a very onerous character; yet it had been expressly decided by the highest Court that the mere omission to disclose them, however morally wrong in many cases, did not amount to legal fraud; and thus shareholders had no redress, though they might afterwards find that the company was hampered with obligations fatal to its success. Here was a substantial grievance to be remedied; a man was not to be invited to join a company without having the means of finding out its liabilities. That this was, in fact, the mischief against which the section was directed will at once appear if it be remembered that the Act was passed upon the report of a select committee of the House of Commons, appointed to enquire into the operation of the Act of 1862, before which committee Lord Hatherley (then Sir W. Page Wood) gave evidence of the existence of the evil, and suggested that all contracts intended to bind the company should be stated either in the prospectus or in the Articles of Association.

It is very reasonably asked, why should a shareholder in a company be put in a different position to a private purchaser? Such a purchaser might in many cases reasonably wish to know what his vendor gave for the property; what disadvantages he had found to attach to it; what interest the vendor's agent or intermediary has in effecting a sale, and many other matters; but no one suggests that a vendor should be bound to volunteer information on these points. If the purchaser desires the information he must enquire, and the vendor can please himself as to answering; but if the vendor has bound himself by a contract which will bind the purchaser, such as a lease or a grant of an easement, he must disclose it. So the intention of the Legislature was not that an applicant for shares should have a right to know everything calculated to deter him from applying, but that he should have the means of knowing the utmost extent of the obligations undertaken, or intended to be undertaken, by the company of which he is invited to become a member.

The matter has sometimes been argued as if the object of the Legislature was that no one should be invited to become a shareholder without being informed of everything calculated to deter him; but, apart from the unreasonableness of such a requirement and its utter repugnance to that most sensible and salutary maxim *caveat emptor*, it must be observed that the Act, however widely stretched, can go but a very small way towards that end. Many things may be of the utmost importance to be known, such as that a manufacturing business has been carried on at a loss, or that a mine has proved unworkable, or has become exhausted; yet the statute can have no application to such cases, it is confined to contracts; and even as regards contracts, cases may be easily imagined in which a knowledge of the contract would be desirable, yet no one would contend that it must be disclosed; thus, in many companies the wealth of a director is important; now, a director in apparently good circumstances may have entered into speculative contracts likely to lead him to ruin, or may have contracted by an ante nuptial settlement to settle all his property on his wife and children. Again, a promoter may have entered into a contract to launch another and competing company as soon as the one in question is fairly started, or he may have contracted to buy a patent which will probably enable him to drive out of the market a part of the company's manufacture; in these and many analogous cases a disclosure of the contracts would operate to deter applicants, and it might even be contended that in conscience a shareholder might reasonably expect to be informed of them, yet surely no one would contend that their non-disclosure would be a statutory fraud.

The object of the enactment, it is urged, is to put an applicant for shares on his guard; if he be told the utmost extent of the company's liabilities it is enough; it would be absurd to deem the directors guilty of fraud for not disclosing some contract by which

the company were to benefit but could not be under liability—such, for example, as a separate contract by a vendor to refund a part of the purchase money in certain events, or to guarantee a minimum dividend for a certain number of years. Imagine a shareholder telling him all the advantages they had to offer. The fact is, the section speaks of contracts by the company, not of contracts with it, and cannot possibly apply to a contract not binding or intended to be performed by the company, but of which on some equitable grounds the company might at its option claim to take the advantage. It is quite true that every right-minded man will sympathise with the desire to put down fraud and deception, but it belongs to those entrusted with the administration of the law to be careful lest they throw the net too wide, and so make the law a trap for the honest and law-abiding. If the subject is not to be taxed to the smallest extent except by plain words, is it possible that men of unalloyed honour, such as are to be found in numbers among the promoters and directors of joint stock companies, are to be branded as fraudsters, and exposed to utter ruin, because after a lapse of nearly ten years a loosely worded and ambiguous clause, hastily and without discussion introduced into an Act of Parliament, has been discovered by a layman, supposed to attach to it? If such were the case, then "a mockery, a delusion, and a snare." Happily, there is no reason to fear such a result, but much mischief may ensue before the question which has been evoked can be finally laid by the court of ultimate appeal. It used to be said—better that ten guilty escape than one innocent suffer, but the danger now is lest in our anxiety to punish one man for what we think a fraudulent concealment, we involve in the like punishment ten men, whose sole crime is that they refrained from publishing contracts which they honestly and reasonably believed themselves to be under no obligation, either legal or moral, to make known. The last three years of commercial depression have severely tried a large number of honest and successful flourishing companies. Some of them, like private traders, have had to succumb, while others are struggling on in the hope of better times. Shares which three years ago commanded a legitimate premium are now only saleable at a heavy discount, and shareholders, after having taken their chance of profit, will be but too glad to avail themselves of any opportunity of throwing the actual loss upon others. If it be once understood that the 38th section is to be read as applying to contracts for remuneration of financiers and others out of the purchase moneys announced as payable by the company, it is not too much to say that the directors of nine companies out of every ten will be exposed to attack. In some rare cases an injured party may in this way gain redress from a wrong-doer, but in the great majority the sufferers will be innocent people, while the complainants will be just those unscrupulous persons who will not hesitate to swear that they would not have taken shares had the contract been disclosed.

Three distinct views have at different times been put forward by different judges as to the relief which the clause gives to shareholders; the first being that the shareholder is merely entitled to rescind his contract, and have his money returned; the second that he has a right of action against the persons knowingly issuing the fraudulent prospectus, but not against the company; and the third that he has a right of action against both the company and those issuing the prospectus. On the whole, the second construction, "A Solicitor" thinks, seems to commend itself as at once the most probable guess of the meaning of the Legislature, and as being at all events warranted by the words, and free from the great practical evils attending a right to rescind. If a prospectus when issued is to be deemed fraudulent then the persons issuing it knowingly (that is, with knowledge of its fraudulent character) may well be deemed guilty of fraud and liable to an action accordingly, while the fact that the prospectus is not declared to be fraudulent generally, or on the part of the company, but only on the part of the individual persons named, is certainly strong to show that the remedy was to be against those persons only. Throughout the pamphlet "A Solicitor" has shown an intimate acquaintance with the various bearings of the question, and his remarks upon the absurdity of wasting money upon litigation where there is little hope of the damages recovered reimbursing the plaintiff, even if he be successful, will certainly add to the reader's confidence in the opinions put forth, whilst disappointed shareholders will do well to remember Lord Chief Justice Cockburn's observation, referred to by "A Solicitor," to the effect that if the company has to pay a certain amount of purchase money, and the shareholders know it, it can matter nothing to them who receives that purchase money.

**GUIDE FOR INVESTORS.**—Messrs. Tallentire and Co.'s "London Investment Circular" for May has just been issued, and contains a good review of the Stock and Share Markets, in which they remark British mines show signs of improvement, and these branches of national industry offer the greatest advantages for the profitable employment of spare capital. British mines, when skillfully and economically worked, pay better than any other medium of investment. For some years they have been greatly neglected, owing to the vast amount of support accorded by the public to foreign mining schemes, which it is evident are soon likely to be brought into prominent notice by interested promoters. The attempt is not likely to succeed unless the public can have so quickly forgotten the ruinous failures of Murchill, Silver Mountain, Emma, Utah, Flagstaff, Last Chance, Tecoma, and many others, which were foisted upon credulous investors at enormous premiums. They recommend several investments as showing the percentage of interest which the dividends to be received will represent upon the purchase price of the stock. The Circular is worthy the perusal of every intending investor.

#### Meetings of Public Companies.

##### GAWTON COPPER MINING COMPANY.

A general meeting of shareholders in this mine was held at the offices of the company, Austin Friars, on Friday, May 18th, Mr. HUNTER in the chair.

Mr. HICKEY (the secretary) read the notice convening the meeting, and the minutes of the last were confirmed.

The accounts for the four months, charging cost to March 25, showed a debit balance of 43H. 0s. 2d. The agents' report was read. The accounts, together with the agents' report, were received and passed.

A call of 2s. 6d. per share was made, payable forthwith, and discount of 5s. per cent. allowed if paid on or before June 15. It was resolved that proceedings be taken against all shareholders in arrears of call, and that a special general meeting be convened for the forfeiture of all shares in arrears of calls made prior to this date if not paid by June 15.

The committee or management were re-elected. A vote of thanks to the Chairman terminated the proceedings.

**WHEAL ELIZA.**—At a meeting of adventurers, held at the mine, on Saturday, the accounts were passed, and a dividend declared of 1L per share. Mr. R. H. Williams, the manager, reported that the mine was looking very well. The sales of tin were about 40 tons per month.

**WEST WHEAL ELIZA.**—At a meeting of adventurers, held at the mine, on Saturday, the first parcel of tin was sold—9 tons 4 cwt. 1 qr. 8 lbs., at 41L 5s., realising 380L 3s. 3d. A call of 5s. per share was made, and Mr. R. H. Williams, the manager, reported that the mine was improving.

**KILLIRETH.**—At the meeting, on May 18 (Mr. John Tregoning in the chair), the accounts for the 16 weeks showed a debit balance of 2650L 13s. 1d. A call of 3s. per share was made, and it was resolved that all shares upon which more than two calls may be due shall be forfeited at the next meeting of the company. Capt. Gough and Pann reported that they have 27 men working on tribute ranging from 4s. to 13s. 4d. in 1L, at which fair wages are being earned. The steam stamps are now in full working order, and giving entire satisfaction. The dressing-floors are also approaching completion.

**WHEAL UNITY WOOD.**—A three-monthly meeting of adventurers was held on Thursday. Mr. Henry Michell occupied the chair. The accounts showed



Periodicals, for the Proceedings of the Institution of Civil Engineers.







**WHEAL UNY.**—Wm. Rich, Matthew Rogers, Joseph Rich, May 21: We have holed the rise in the 160 west; this has well ventilated the bottom level, and has 80 ft. per fathom. The 180 east is in easy ground; the lode is worth 60 ft. per fathom. The 150 west, but hope to secure a very valuable vein, the level in a week or two from this time. The 150 rise, towards King's, is worth 60 ft. per fathom. The 140 end, east of King's, is worth 12 ft. per fathom. The 130 east is worth 8 ft. per fathom. The 60 west is worth 7 ft. per fathom. We sold on Saturday last 11 tons 7 cwt. of tin.

**WYE VALLEY.**—John Kitto, May 22: The sinking of the main engine shaft below the 44 is satisfactorily progressing, and the lode has greatly improved in character since we commenced to sink it, and is now yielding strong spots of lead ore. The 22 driving east is looking much better than it has for some time past, and the part of the lode that we are carrying is productive of ore for the full width of the end, and is worth at present about 1½ ton to the fathom. A few fathoms behind this end we have commenced to sink a trial winze, which contains a very good branch of ore, and which continues to improve as we get deeper. The floor of the mine is considerably strengthened by our convictions that the 22 is only in a poor position, and that the level will prove equally as productive as the 10. The rise above the adit level, towards the 22 shaft, is progressing favourably, and I hope to effect a communication in about two months from this date.

**ECHOES FROM THE MINING MARKET.**

The markets continue without animation, yet a fair amount of business is being transacted in the more favourite investments. Lead remains firm, tin is quiet, coal has a tendency to advance, but copper is a trifle weaker. The prices of many mining shares are only nominal, owing to the absence of general business.

The difficulties of another lead-smelting firm have transpired, but we believe we are correct in assuming that its position has long been considered a very unsatisfactory, whilst its transactions have been of a very limited scale, although one leading mine which incurred a heavy loss, the Bury Port failure will, we fear, again suffer. The suspension is not likely to affect lead shares generally, owing to the restricted nature of the company's trading. This failure, following as it does so closely upon that of the Bury Port, should be sufficient to impress upon the directors the absolute necessity of selling ores only to first-class houses.

The country market for foreign shares has been very irregular. A heavy decline has taken place in New Queensland, and the shares which were in demand last account at 4 and 4½ are now but 2 to 2½, and have touched 1½. We understand the produce has not realised expectations. Richmond have been in request at 6½ to 7, showing an advance of fully 20s. on the week. Chontales have also attracted attention, and the last price—64, to 8s.—exhibits a better market. Flagstaff, Frontino, and Eberhardt have been quiet, Pestreña in demand at 3s. to 8s., and Javal at 7s. to 8s. A dividend of 7½ per cent. for the half-year (16 per cent. annual) has been declared by the Spanish Australasian Bank, in the same amount as last year. The shares are quoted 15½ to 17½, having steadily fallen from 25½ to 23½. It is extremely probable that now the dividend is known the price will rally again. Exchequer remain dull at 3½ to 5½.

Amongst lead shares the principal business has been confined to the usual leading dividend mines, and to North Laxey, Rookehope, Monyold Gordin, Glyn, Van Consols, and West Tankerville. Prices have generally been in favour of buyers. North Laxey at 11s. to 12½, with good financial resources and a promising mine, should be classed as a good investment. In South Laxey the mine is in good demand close with a dull tendency. Glyn, 13½ to 15½. Van Consols, 13½ to 2½. The work at this mine is making fair progress, and the lode will be cross-cut at the 59 under adit next week. A slight improvement has taken place at Ashtown in the pitch in the bottom of the 40, and 30 tons of lead and 3½ of blende have been sampled for sale. From Combarnet we hear the 31 and 29 are both looking fine. East Van have been very quiet at 4½ to 5½. The Tempest shaft is down 30 fms. Glenroy quit has been quiet, the statistics display that has taken place in firms and the lead affecting the bonus shares of the Tempest being 2½ to 3½. Tin shares have been dull. Rio's have occurred in the Took's district of the Strath settlement, so from this quarter shipments will probably be interrupted. The deliveries for May are expected to be very good, and the month's statistics will doubtless show well. As a set-off to these more favourable conditions we hear that the tin-plate works are to be closed one week out of three. There is little to say this week about Cornish tin mines, beyond noting the satisfaction expressed by the late South Cornwall tin mine, and the fact that the meetings of Kilbuck and South Crofty, the first and second, have been successful. The mine, for a young concern, is looking well and promising. The Peewee call of 7s. 6d. was due to the fact that two months' tin only had been charged against four months' cons.

In copper shares business has been confined to Devon Consols, Penrithul (tin and copper), Cathedral, Parys Mountain, and a few of the Cornish mines. There is a favourable change in the north cross-cut out of the 112 west at Devon Consols. The shares have been in demand at 15s. to 16s. We understand that there will be some alteration with regard to the bonus shares of the new Morfa Ddu Company, owing to legal difficulties in the way of the present arrangement, and a circular on the subject is about to be issued to the shareholders of Parys Mountain. Gawton—long a neglected share on our market—has been enquired for several times lately, and from about 1s. the price has risen to 6s. 10s. With a judicious selection it is not a very difficult matter to gain large percentages of profit over low priced shares. The shares of the Parys Mountain, and the Parys Mountain, are the only advances. From a merely trifling value are generally good. Thus, it often becomes the fashion to neglect shares for a considerable time, and the merits of the mine are consequently overlooked. An improvement may take place, but it is passed by unnoticed by most. A few, however, have quietly picked up shares, and an enquiry on the market sets dealers and others on the alert, and the price goes up with a rush. At Cathedral the 42 east presents every indication of nearing a rich lode. Penrithul, too, is proceeding steadily, and the management is doing all that is looking forward to the cutting of a good course of copper. Marke Valley at 17s. 6d. to 20s. have been in demand.

A rather better business has been done in colliery shares, but iron securities meet with little enquiry. It is expected that the second shaft at Chapel House, now down 205 yards, will reach the Park seam—cut at a depth of 387 yards in the other shaft—by the end of the year, when the present output of about 300 tons per day will be considerably increased. The shares are 2½ to 3s. Cakenon and the 40th Crofty, the first and second, have been successful. The mine, for a young concern, is looking well and promising. The Peewee call of 7s. 6d. was due to the fact that two months' tin only had been charged against four months' cons.

**JAMES H. CROFTS.**

**THE WEEK.**

**SATURDAY, MAY 19.**—Egyptians had a further rise to-day, and it seems highly probable that they will advance still more. The approaching coupon of the United is understood to be provided for, and the Foreign Commission appears to work well. The Preference closed 52½ to 52½, the United 34½ to 35. In railways, Great Eastern and Metropolitan District were most in favour, both advancing ½. Great Eastern closed at 48, after being 45½. Exchequer, 3½ to 3½. Chicago, 3½ to 3½. L.X.L. 3½ to 4½. Leadbills, 6½ to 6½. Glenroy, 1½ to 1½. Parys Mountain, 6½ to 8½. South Crofty, 1½ to 1½. West Tankerville, 1½ to 1½. Bombay Gas 10½ to 11½. Commercial Union 17½, Odessa, A, 4½, and Price's Candle 10½.

**MONDAY.** Bank holiday, Stock Exchange closed.

**TUESDAY.**—A serious fall took place in New Queensland shares. They were first dealt in at 3½, but afterwards so many were forced on the market that business was done at 1½, the closing price being 1½ to 2. A long report from Mr. Darlington shows pretty clearly that further expenditure will be necessary to give paying results. This, of course, is a great disappointment to shareholders, who have been looking for a railway to bring the ore to the coast was all that was required. The railway in question (Bolivar) remained unchanged throughout the day, being quoted 7 to 9. Richmond improved to 6. A large business was done in Egyptian stocks—the United went as high as 36½, and the preference to 54½; but the closing price was 35½ and 52½ respectively. Great Eastern Railway, after touching 48½, fell to 47½; and afterwards, just at the close, jumped suddenly to 49½.

**WEDNESDAY.**—New Queensland recovered somewhat from yesterday's depression, and from being 2½, sellers, left off 2½, buyers, though business was done as high as 2½. It appears from Mr. Darlington's report that "peons (native labourers) demand more than twice the amount which satisfies a mine" in Cornwall, and nearly half as much again as the sum paid for a mining shift in Australia, whilst the year is subject to a deduction of 112 days for Sundays, feast days, and holy days. Charcoal costs 3s. 12s. per ton, and the cost of dry wood is equivalent to paying 50s. per ton for coal. There is a great disappointment to shareholders, who have been looking for a railway to bring the ore to the coast was all that was required. The railway in question (Bolivar) remained unchanged throughout the day, being quoted 7 to 9. Richmond improved to 6. A large business was done in Egyptian stocks—the United went as high as 36½, and the preference to 54½; but the closing price was 35½ and 52½ respectively. Great Eastern Railway, after touching 48½, fell to 47½; and afterwards, just at the close, jumped suddenly to 49½.

**THURSDAY.**—Markets opened dull, but when Consols had advanced ½ railways rallied, and Sheffield, Caledonian, and Dover A were dealt in at higher prices. The closing was, however, dull, Gr at Eastern being especially heavy, and closing ½ worse (48½ to 48½). Richmond sustained a strong demand, closing 6½ to 6½, and then improving to 7½, 7½, which they closed. New Queensland at one time reached 12½, but fell to 12½, but they closed weak at 12½ to 12½. Glenroy, 3½ to 3½. Bampfylde, 7s. to 8s. Exchequer, 3½ to 3½. Rookehope, 17s. to 18s. (and very weak, many of the dealers wanting to sell). Van Consols, 13½ to 17½. North Laxey, 11s. to 13s.

**FRIDAY (Opening).**—In railways, District and Dover A, are a ½ easier, Sheffield still 68 to 68½. Consols are 94½ to 94½. Several railways, and some shares, were mainly in consequence of another meeting of difficulty. Van Consols can be had at 1½, and West Chiswick under 1½. Tankerville are dull at 7 and Rookehope are really offered at 15s., nothing being done. North Laxey are quoted 12s. 6d. to 15s. Leadbills, 5½ to 5½. Glenroy, 3½ to 4. East Van, 5 to 6½. West Tankerville, 7½ to 11; ditto Preference, 1½ to 2. Pennerley, 3½ to 4. Kipanga, 1½ to 1½. Richmond are offered at 4½, which is lower. New Queensland are weak at 12½ to 2½. Gorsead and Merilyn, 5 to 5½. The 14, 12, New Starbon dill. Newport Abercrom, 2½ to 3. Cardiff and 8½. Tico's—Markets have been very buoyant, but now quiet, prices, however remaining higher than at the very beginning of the week. Midland, 126 to 126½. Caledonian, 117½ to 118. Great Western, 95½ to 95½. Dover A, 107½ to 107½. Great Eastern, 49 to 49½. Consols are 94½ to 95½. Richmond, 187½ to 17½, and Egyptian Preference, 54 to 54½. Peruvian Fives are 12. Four of 184½. Great Western, North-Eastern, and North-Western



Richmond, Va to 7; the usual weekly telegram states that the refinery has produced dore bars to the value of \$15,000. Western drift greatly improved, raised 60 ft. on good carbonate ore. The manager's report states that the 500 ft. drift has been extended a further 10 ft., and that a decided improvement has taken place in the ore in the winze sunk 20 ft. below the 500 ft. drift. A drift from the 600 ft. has been started to cut the winze sinking from the 500; and the manager remarks that a pipe of ore in this part of the property will greatly enhance its value. The announcement in this week's telegram that the westerly drift from the main shaft at the 500 ft. level had greatly improved, and that a rise of 60 ft. from it was in good carbonate ore, is the most cheering piece of information that has been received for some time, establishing as it does the existence not only of a large body of good ore in ground supposed to be barren, but ore of the sort needed to flux the large reserves of ferruginous ore left standing for lack of lead to utilise them. The westerly drift from the 500 now being pushed forward towards the Tip Top Mine, from which it is still some 600 ft. distant, having encountered a body of ore already proved to be 60 ft. thick, opens out the vista that the vein or pipe thus struck may







## Notices to Correspondents.

SIR,—In the Journal of Jan. 20 I observed a brief notice of an invention by a Mr. Bentley, for returning steam to the boiler without condensation after it had done its work in the engine, but have not since been able to learn anything further about the invention. Will any of your readers kindly inform me what are its general principles and construction, or where it can be seen in action? As I wish to ascertain its suitability for a different and special purpose that I have in view.—WM. ROBINSON: *Russell-square, May 18.*

WEST GREAT WORK TUN MINE.—Can any of your readers give information respecting the above mine, and say what has been done with the capital since the last company was formed? Are operations stopped, and the concern to be wound-up?—SHARERHOLDERS.

SILVER HILL.—Will you allow me, through the medium of the Journal, to ask what, if anything, is being done in opening out this mine? I have written to the manager, as no reports are published, for information, but he makes no reply, and, as a shareholder, I hold I am entitled to some information. Unfortunately I live too far away to visit the spot.—X.

Received.—“R. H. T.”—“Subscriber” (Wolverhampton)—“C. W.” (Neath)—“J. C.” (Calcutta)—“P. N.”—“E. A.”—“A. R. C.” (New York)—“J. B.” (San Francisco)—“J. B.”—“H. R.” (Pneumatic Ore Dressing): Letters forwarded.—“Shareholder” (New Consols): Write to the Secretary, who will supply the information.—“Shareholder” (Bedford United)—“Sulphur” (Parys Mountain)—“Zanzibar”: We think not.—“Constant Reader” (Manchester): Should apply to Messrs. Berger Spence and Co., Elmsmere Chambers, King street, who will give him the particulars.—“Speculator” (Epsom): We never answer such questions, apply to your broker.

THE SUPPLEMENTARY SHEET.—We have received occasional complaints, and of late a good many, that the Journal is delivered by country booksellers without the Supplement. Subscribers would oblige us by demanding that the paper should be handed to them complete, as every Journal is accompanied by the Supplement when it leaves our office, and the fault of omission must rest with the country bookseller or their London agent.

## THE MINING JOURNAL.

Railway and Commercial Gazette.

LONDON, MAY 26, 1877.

## THE FLOODING OF COLLIERIES.

THE TYNEWYDD DISASTER.

Under the above head, in the Journal of April 28, we drew attention to the disaster in South Wales, and pointed out how essential it was that there should be authentic plans, not only of a colliery being worked, but also of the adjoining old workings, so as to prevent an inundation. On that occasion we remarked that we would not go so far in saying that it was from there not having been a reliable survey and reliable plans that was the cause of the disaster, but we should be considered as guilty of pre-judging the case, but should notice the subject on the conclusion of the Coroner's enquiry. We have now the evidence before us as well as the verdict of the jury, and our views indicated in a former article have been fully borne out. According to Mr. WALES, the Government Inspector for the district, it appears that a heading in one place had been driven at the rate of 11 yards per month, but unfortunately no measures were taken to ascertain how far off the boundary was. This was not only a serious but a fatal error, for nothing can be of greater importance in approaching old workings than knowing the thickness of strata that divides them from the places where the men are working, so as to leave a sufficient thickness to resist the pressure of the water. But, so far as the evidence goes, it does not appear that the most ordinary precautions were taken by the men or the officials to ascertain how far off those working in what is known as Oatridge's heading were from the water on the other side of the coal in the old workings. There was no knowledge on the part of the chief officials of the old workings, whilst the Act of Parliament requires that plans of abandoned mines must be furnished to the SECRETARY OF STATE within three months after abandonment. It is also provided that certain precautions shall be taken on approaching places where accumulations of water might be expected by means of a bore-hole. But everything was left to chance; whilst, as the Coroner stated, the officers of the pit were ignorant, uneducated men, one of the deputies having stated that he could neither read nor write. Under such circumstances it is certainly not surprising that an accident causing the loss of several lives should take place. Mr. WILLIAMS, the manager, we are told is a skilful mining engineer, and one would have thought he would have selected men of practical experience and some education to act under him. It is the duty of a manager to attain safety and economy, to know the character and attainments of the men he appoints to places of trust under him; but if he takes them at random, not knowing whether they can read or write, he jeopardises the lives of all the men working in a colliery. But not only was this the case, but there does not appear to have been an actual survey of the place after December, for the usual precautions should have been taken to prevent an outburst of water after the heading had been driven a certain distance. This was the actual cause of the accident.

A plan was produced at the inquest which the Coroner remarked was one that they could place no reliance on. One of the pleas put forward on the part of the officials was that a 7-yards "throw" was expected to be met with before the boundary was reached. Relying on this only shows that the plan and survey on which it was made were wrong, but we are not told who were the parties really responsible for both, but the mistake was one we should suppose could not easily be made by a competent man. In all our mining districts correct plans and sections are made out, showing the position and inclination of the coal or stratum, with the position of "faults," heaves, liability to exhalation of gas, water, with old workings. With such plans and proper supervision an accident such as that which took place in South Wales would be all but impossible. We admit that many of the plans in existence cannot be relied upon, for the protracting of one line from the preceding, and so on in succession, leads to almost every error, and is a system of guess-work, or "judging," as it is termed, but is not the work of a good engineer, for the accuracy of a survey can be tested exactly by calculation before being laid down on the plan.

The result of the Coroner's enquiry was that the jury returned a verdict of manslaughter against the manager, the death of the five being attributed to culpable negligence on his part. They also added that they thought the act arose from a mistake of his in inspecting the fault. Mr. THOMAS was then committed for trial, but bail was accepted. We deeply regret that such a verdict was indispensable, and that a gentleman of undoubted ability in his profession should be placed in such a painful position. It shows, however, how serious what at first might appear as only a trifling accident may ultimately turn out. How necessary, then, is it that there should be the most reliable plans in connection with our collieries, and how essential it is that the underground officials should not only be practical but intelligent, and able to read and write, to say the least. Where these desiderata are wanting the men placed in positions of trust, entrusted with the lives it may be of hundreds of others, are mere machines, only capable of performing a certain amount of manual labour. Ignorance is too often the cause of culpable neglect, and the sacrifice of many lives in our mines and in no other description of work is more necessary than men having the control and management of others should be thoroughly acquainted with the engineering experience and applied ability of our best writers, so that they should be in a position to meet any emergency. Our mining engineers, we admit, pay a great deal of attention to the ventilation of collieries, so as to prevent explosions, but they should also keep in their minds as well that water in our mines has had its victims as well as gas, and that they should always be on their guard against the one as well as the other. To be in such a position, as we have before stated, there should be plans not only of the workings in operation, but those of others adjoining that may have been abandoned, and these in every way most accurately tested and always available. The want of such plans, with overmen ignorant of what they should have had a good knowledge of, with some neglect in the surveys, led to the

accident at the Tynewydd Colliery, with the loss of five lives, and the commitment of the manager. The result of the enquiry we have every reason to believe will be beneficial, and lead to more complete supervision of our collieries, and the employment of more efficient officials, and so ensure increased safety to the miners.

## AMERICAN IRON SHIPBUILDING.

One of the problems which the Americans—that is, the Pennsylvanian Americans, and, to do them justice, we must observe that the Pennsylvanian Americans appear to us to be the best of the Americans—are endeavouring to solve is the building of iron steamers upon as cheap and efficient conditions as those upon which similar steamers are built in Great Britain. Thus, recently Messrs. J. ROACH and SON launched from the Delaware River Iron Shipbuilding and Engine Works at Chester, Pennsylvania, an iron screw steamer intended for the New York and Havana trade, and built for Messrs. J. E. WARD and Co., of New York. The vessel was named the Niagara, and it may be observed that it is the twenty-seventh steamer built by the same firm for commercial purposes. Its principal dimensions are as follow:—Extreme length, 292 ft.; breadth, 38 ft.; depth from hurricane deck, 31 ft.; and from main deck, 23 ft. At the load-line it will draw 16 ft. 6 in., and it will be about 2400 tons burthen. The Niagara is to be ready for sea early in June; it is being rigged as a brigantine, and is to be furnished with four cylindrical boilers, each 10 ft. 6 in. long by 12 ft. diameter, which will supply steam at a working pressure of 80 lbs. per square inch to a pair of compound engines. The diameter of the high-pressure cylinder of these engines is 34 in., and that of the low-pressure cylinder 60 in., the stroke of the piston being 54 in. The Niagara is fitted with a propeller of the Hirsch pattern, 15 ft. in diameter, with a pitch of 21 ft.; the maximum number of revolutions will be 75 per minute, giving a maximum speed when loaded of 14 knots per hour. Since the launch of the Niagara, the Saratoga—an exactly similar steamer built for the same owners, and intended for the same trade—has also been launched from the same yard; the Saratoga, it may be added, is to put to sea in the course of July. Messrs. ROACH and SON have now five other commercial steamers on the stocks in their Chester yard, and they are employing 2300 men there.

Messrs. ROACH have been content with small profits in connection with the building of the Niagara, their object being, to some extent, to increase the prestige of American shipbuilding industry. This prestige once acquired, they rely on securing more substantial pecuniary results in future. Not only do Messrs. ROACH expect to obtain good orders from their own countrymen but they think also that there is some chance that as foreign steamships become worn out many of them will be replaced from American yards. The shipbuilding firms of the Clyde, the Mersey, the Thames, and the Humber cannot be altogether indifferent to this development of iron steam shipbuilding on the banks of the Delaware. It is true that if the Americans are energetic and enterprising they are also of a very sanguine temperament, and they may accordingly deceive themselves as to the results which they are likely to attain in connection with the comparatively new department of industry and effort to which they are devoting their attention. Still we must not overlook the fact that the American iron trade has acquired a greatly increased importance of late years, and that as the productive powers of the United States in the matter of iron have become much greater it is necessary for American ironmasters to find outlets for their plates, rails, &c. We may depend upon it, then, that great exertions will be made by the Americans to develop a vigorous shipbuilding industry of their own, and even to compete with us in the construction of iron shipping. This being the case, we can but view with regret the disturbed state of the labour market as regards the shipbuilding trade of the Clyde and the coal trade of Lanarkshire. The Clyde shipwrights recently came out for an advance of 1d. per hour in their wages; the coal miners have also demanded an advance, and a strike has been threatened at one or two collieries. We have seen what American competition has done for us in the matter of rails. Is this a time when the shipwrights of the Clyde should be at sword's points with their employers and when attempts should be made to increase the difficulties of Clyde shipbuilding firms by strikes which must have the effect of rendering coal dearer? It is only by reasonably cheap labour and reasonably cheap raw materials that British manufacturing industry can hope to hold its own, either in the matter of shipbuilding or any other department of human effort. When will our working classes duly appreciate this important fact?

## "THE TIE IS BROKEN."

Such was the expression made by Mr. ROBERT CRAWSHAY, the extensive ironmaster of Cyfartha, South Wales, in a recent address to his workmen. It is both ominous and expressive. It has reference to the severance of that spirit of amity and confidence which once existed between master and man, but which is now being gradually accomplished by the persistent agitation of the Trades Unionists. One ounce of practical experience, it is said, is worth a whole bushel of theoretical experiments, and the emphatic observation of such a man as Mr. ROBERT CRAWSHAY as to the severance of the kindly feeling which once existed between employer and employed is far more weighty and important than all the empty assurances of Unionist leaders as to the benefits arising from increased wages or the many specious promises of improvement which are to result from their agitation. We do not belong to that sentimental class which is always sighing over the "good old times long since gone by." The present, all things considered, is vastly superior to any former days in England's history, but still there were ties and connections in the past which cannot be rudely broken or ignored in modern days, and the amicable relationships of master and man which once existed, but which are now being rapidly destroyed, have already produced disastrous consequences, and will eventuate in still more serious results.

Mr. CRAWSHAY returning home after a brief absence, which he was compelled to take for the benefit of his health, was presented with an address by his "old workmen" expressive of their gratitude of his restoration to health. After referring to his early connection with Cyfartha, and the pleasure it afforded him when a young man to work amongst the workmen from morning until night, and his "nursing" the concern up to its gigantic dimensions, Mr. CRAWSHAY concluded his address with such ominous language that we cannot but repeat it. "The happy time," remarked Mr. CRAWSHAY, "has passed, and black times have come since then. You threw your old master overboard, and took to strangers, and broke the tie between yourselves and me. When the Unionist deputation came up to me at the Castle, and I asked them to give me a fortnight to work off an old order of rails and they refused, I then told them the old tie was broken, and from that day to this it has. \* \* \* I believe every works which is going is losing money. I know I have lost money for years, and have not made a single farthing since the works have been in my sole possession, but I should never while I have money have stopped the works if you had not all left me and joined the Union." Now, here we say is a practical result of the suicidal policy adopted by Trades Unionists which should be seriously pondered over and laid to heart by every workman connected with the great staple trades and industries of the kingdom. The Cyfartha Iron Works, its collieries, and its many connections were only a few short years ago amongst the most extensive and important and flourishing, not only in South Wales but the United Kingdom—if not, indeed, the world. They gave employment to thousands of workmen and their families. Chequered, indeed, has been its history; prosperity and depression have alternated; times black and ominous as the present have been seen; commercial storms as intense and protracted as those of to-day weathered, and difficulties as great as now successfully overcome, but never, we believe we may confidently state, have the works been closed for a week; never but good wages could be earned by steady sober workmen, and never had an old workman been then discharged on account simply of slackness of times. The simple fact is that the Messrs. CRAWSHAY ever took the deepest interest in the welfare of their workmen. They cemented the tie between themselves

and their workpeople, which was one of the chief foundation stones upon which they reared their gigantic works. In times of depression they made money rapidly, and doubtless abundantly; in depressed seasons they worked as freely spent out of their husbands' resources, and were enabled to keep together in the darkest and most dreary, however, "broken tie" which existed in former days, they have knocked the foundation stone of the whole works from the long and secure resting place, producing such serious consequences that Mr. CRAWSHAY adds—"My losses have been so very great that I am now bound to do all I can to lessen them, which is the reason of my discharging men now, and reducing the days of work."

A distinguished French author, H. BOSSELET, has just written and published a pamphlet under the title of "L'Union des Classes," the object of which is to show that the security, the welfare, and the grandeur of the country depend on the unity of classes, and he implies, on the good intercourse between *la bourgeoisie* and *le peuple*—that is, between capital and labour. Without endorsing the author's views as to the political aspect of the question, we cannot be too strongly denounced by the press and the public generally. The Cyfartha Works is a notable example. If England is again to become commercially powerful and strong it can only be effected upon the principle of mutual confidence and co-operation. The mere rise of a shilling or two in wages is not the only object in view; nor should the reputed wealth of the employers be the constant source of jealousy on the part of the men. The solidity and permanence of our staple trades and manufactures should be their first consideration. Let every workman strive honestly and earnestly in his respective sphere for this, and our prestige as a manufacturing nation shall soon become re-established, prosperity again set in, wages again raised as a natural sequence, and every section of the community participate in the prosperity. Until these lessons are learned by our working classes it is useless to decry bad times and low wages, for such are the inevitable results of the abruptly broken tie between employer and employed brought about by the persistent agitations of Unionists.

## NEW AND ECONOMIC MINERS' EXPLOSIVE.

The progress made during the past few years in the production of explosives for the use of miners has been enormous, and the opinion is now almost universal that an explosive stronger than ordinary blasting-powder enables the working miner to earn better wages, and is advantageous to the mine adventurer, even when the cost price per pound of the explosive is considerably higher. The price of good blasting powder is from 5s. to 6d. per pound, yet a value has been found to result from the use of dynamite at 2s. a pound, because 1 lb. of dynamite will do more useful work than 1 lb. of blasting-powder. But the great recommendation of the new explosive is that whilst it is nearly as powerful as dynamite, its price is only from one-half to two-thirds that of common blasting-powder, and it is entirely free from danger; indeed, it is proposed to introduce it as a substitute for gunpowder, dynamite, gun cotton, and other dangerous explosives now so largely used in collieries and in mining and quarrying operations, for while containing all their essential properties it is practically harmless, may be handled with impunity, and supersedes them most completely in its practical results, in addition to which it may be manufactured at a price which (assuming it to be delivered to the miner at 3½d. per pound), and that commission to the agents selling it were paid at 15 per cent. on the retail price) would give over 12½d. per ton profit to the maker. That such an explosive would be a great boon to both colliers and non-liferous miners cannot be questioned, and its manufacture would certainly become an important industry.

It appears that for some years past several scientific gentlemen have devoted their energies to the subject, and the result of their researches has been the discovery of the present explosive, which, however, is mainly due to Mr. CAMILLE ESPRIT, by whom it has been patented in this country. It has been submitted to every variety and phase of experimental tests on an extensive scale, thoroughly establishing its reputation. The chief advantages claimed for it are that there is no risk attending its manufacture, storage, or carriage; that there is entire freedom from danger in the open air; that it can be handled fearlessly, being free from explosion either by detonation, friction, spontaneous combustion, flame, or heat; that in the event of its being damped it can be safely dried by exposure to the fire; that the effect on explosion is the splitting up of the rock or other substances in large masses in contradistinction to the shattering effected by gun cotton, &c.; that it is improved, rather than deteriorated by keeping; that no expensive material is required for its manufacture, and if the same weight of each be used, its explosive power is double that of gunpowder; that less satisfying effects are experienced on explosion; that it can be used in ready the usual way; and that weight for weight its volume is double that of gunpowder. The merits of the invention were thoroughly discussed at a recent meeting of the Inventors' Institute, and the opinion was unanimous that the new explosive possessed many advantages over any at present in the market.

It is proposed, in the first instance, to establish a factory at Cuddington, near Plymouth, which it is estimated will cost, with materials, 12000. to 13000., and be of a sufficient manufacturing capacity to supply the counties of Devon and Cornwall, which annually consume about 1000 tons of common gunpowder, besides a quantity of dynamite, and arrangements have been made by Mr. Esprit with Lord Grave, the freeholder, for an important site, which Mr. Esprit will surrender to the company. This site is considered to be very desirable, on account of its proximity to wharves on the sea coast, where vessels frequently call, and is rendered more especially so when it is taken into consideration that freight in this part of the country are extremely moderate. Admitting that until this important discovery becomes thoroughly known and appreciated the demand would not exceed 12 tons per fortnight (about a fourth part of the present consumption of gunpowder and dynamite in the before-mentioned counties), the profit on this sale alone would amount to 153½ in that period, or 5978½ per annum, thus showing a profit of nearly 20 per cent. per annum on a capital of 20000.; so that, as a commercial enterprise, the invention is very reasonably regarded as offering a fair field for development.

COAL IN FRANCE.—During 1876 the output of coal in France reached 17,017,773 tons, being an excess of 98,729 tons over that of the preceding year. This was extracted from 67 basins, situated in 82 departments.

COAL AND IRON IN THE UNITED STATES.—The demand for steel rails has continued light at Philadelphia; quotations are, however, nominally unchanged. Sales of 6000 tons to 8000 tons have been effected during the last few days; important concessions in price would probably be made to effect good cash sales. The nominal quotation is still 34s. to 35s. per ton currency at the mills. There has been little change at Philadelphia, either as regards price or demand. The disposition is to sell for cash or for un doubted security, hence comparatively few transactions have been reported. Quotations have ranged from 33s. to 35s. per ton currency at the mills. The Philadelphia pig-iron market has been quiet and steady. The usual moderate demand has prevailed, and prices have experienced little change. The manufactured iron market at Pittsburgh has remained in the same state as for some time past. There has been little change noticed in steel at Pittsburgh; business has continued fairly active, and the mills are all busy. The aggregate production of anthracite and bituminous coal in Pennsylvania to April 26



This year amounted to 5,567,405 tons, as compared with 5,482,025 tons in the corresponding period of 1876, showing an increase of 1,134,480 tons this year. The movement of coal and coke over the Pennsylvania Railroad to April 21 this year amounted to 2,452,026 tons, of which 1,173,493 tons were coal.

**THE BETTISFIELD COLLIERY COMPANY.**—A correspondent tells us that the magnificent works of the Bettisfield Colliery are situated at Bagillt, in North Wales. There are monster platforms where the screens are at which the coal is loaded. At night hundreds of gas-lights give the place a most animated appearance. An elegant viaduct leads from the screens to the pit bank, where a monster pit-head carries the pulley-wheels. Great engine-houses of brick and stone, and tall chimneys, indicating the existence of great boiler power, show what an enormous capital is engaged, 20 steam-engines, some of very great power—being already employed on the works. The works are set out with the latest improvements, and every attention is given to the comfort and safety of the colliers, who work here on the eight-hour system. Before these works started there were hardly any colliers in the district, and Bagillt was but a poor place; now the colliery company have attracted a large number of colliers, and Bagillt is one of the most prosperous places in Flintshire. Underground is a great drift, in size like a railway tunnel and arched with Buckley and Brynbo bricks. Out of this tunnel workings are made in five seams of coal, the thinnest being about 3 ft., and the largest about 11 ft. in thickness of pure coal.

#### THE COPPER TRADE.

We notice with great regret the gradual fall in the price of copper and of copper ores.

At 13s. 6d. per unit is now the price at which ores of good quality are sold, and Chili bars are selling at 65s. 10s. per ton. These are very low prices, and must be unremunerative to several of the most productive mines.

It is generally supposed that the mines of Chili cannot be worked profitably at the present prices. A very few of the mines in Cornwall and Devon, perhaps three or four only, can do more than meet their costs; and of foreign mines, such as those in South Australia, the Cape, and those of Spain and Portugal especially, must suffer very much.

The mining company of New Quebrada appears also, from a heavy fall in the price of its shares, to be seriously affected by the prospects of the copper market. The truth seems to be that the supply of this metal exceeds the demand for it, and that the only cure for this state of things is such a diminution of the quantities from several of the most productive mines as will bring about a better state of things.

It would be invidious and beyond our province to name any particular mines to which the above remark would especially apply, but they are well known, as their published reports testify.

#### REPORT FROM THE NORTH OF ENGLAND.

May 24.—The suspension of labour threatened last week in the coal trade of Durham by reason of the differences between the colliers and their employers has this week been averted by the triumph of moderate counsel in the Colliers' Association. A meeting of the colliers' executive was held at Durham on Tuesday, when a resolution was agreed to pledging the association to conformity with the terms proposed by the owners, provided the latter were willing to agree that the consent of the men was accepted without prejudice to the future. This the owners agreed to at a meeting held yesterday (Wednesday) at Newcastle, and to-day Mr. Banning, the secretary of the Coalowners' Association, signified to the colliers' executive the acquiescence of the owners, and their agreement to withdraw the notices for a reduction pending the result of the arbitration that will now ensue. This result of the negotiations that have been carried on with more or less activity for the past six weeks, and out of which a rupture seemed at one time inevitable, has been hailed with much satisfaction, especially by those engaged in the iron trade, for if the colliers had stopped working it would have made shipwreck of the prospects of our metallurgical industry; at least, for a time.

The South Durham Iron Company, whose works are situated at Albert Hill, Darlington, have stopped payment. The liabilities are understood to be heavy, although the exact amount is not known. The unremunerative character of the pig-iron trade, and the large stocks accumulated at Darlington, are understood to be the cause of the failure. The works are to be offered for sale by public auction about the end of June, and about the same time the Lokenby Iron Works, near Middlesborough, will be brought to the hammer. The latter works are also engaged in the manufacture of pig-iron. As inflicting in a general way the state of the iron trade in this district I may add that the works of the West Hildesford Iron Company, of the Britannia Iron Company, of the North Yorkshire Iron Company, of the Eton Grange Iron Company, the Bishop Auckland Ironworks and the works of Thomas Vaughan and Company, are also in the market, and these are but a tithe of the works now standing. It has just been found that there are about 16 of the works connected with the Northern Board of Arbitration now idle, all of them engaged in the manufacture of finished iron.

The reports of two limited liability companies, both engaged in the manufacture of finished iron in this locality, have been issued during the past week, and both bespeak a condition of great tribulation, although much more satisfactory than other concerns in their neighbourhood. The first report is that of Hopkins, Gilkes, and Co., and it shows a profit of 5958s. on the working of the past year, after writing off 11,000s. for bad debts and legal expenses. The second report is that of the Skirone Iron Company, Darlington, who have only made a profit of 5061s. on the production of 24,074 tons of plates and 776 tons of bridge work. Owing, however, to bad debts incurred the net profits of the latter company have been reduced to 807s.

There has only been a meagre business done in iron during the past week. Perhaps the Whitsuntide holidays have had something to do with this depression, but the generally unsettled state of political affairs abroad and industrial affairs at home may be assigned as the main cause. No. 1 pig-iron was quoted on 'Change on Tuesday at 45s. per ton, No. 3 at 41s. 6d., and No. 4 forge at 40s. net. Some makers are selling at less than these figures, but strong holders decline to accept less money. It is, however, highly probable that owing to the recent failures a large quantity of pig-iron will soon be brought to the hammer, and in this event it is probable that prices may temporarily take a still lower range. On the other hand, there is again some talk of blowing out a number of furnaces, and I learn that the three furnaces of the South Durham Iron Company are about to be dumped down, preliminary if they fail to find a purchaser to their being altogether blown out. The stocks of iron now in makers' hands represent about 220,000 tons, and 110 furnaces are in blast.

Affairs are pretty much in statu quo with regard to the Cleveland iron-works and miners. The arbitration proceedings, to which I referred last week, were concluded on Friday, but on Saturday the umpire (Sir J. F. Stephen, Q.C.), at the request of the Miners' Association, paid a visit of inspection to one of the mines. The mine selected was that of the Messrs. Morrison, at Brotton, which was suggested by the men, and admitted by the owners, to be fairly typical of the district. The umpire was shown through the intricate workings of the mine, and had the whole of the processes of the representatives of the miners and mine owners respectively. The umpire and his assistants will meet next week in London to consider their award, and should it happen to be unfavourable I understand it will probably lead to a discontinuance of some of the ironstone mines now being worked in a sort of starvation fashion.

Throughout trading circles in the North of England the threatened suspension of the Northumberland collieries is regarded with great anxiety and apprehension. Efforts are being made to avert a total stoppage by getting the men to consent to arbitration on the proposed 10 per cent. reduction pure and simple, and I believe that these will be of some avail.

In the Durham Coal Trade affairs are, except in regard to the matters I have mentioned, practically without change. The threatened stoppage of the collieries and coke-ovens had the effect of temporarily raising prices, but this is not likely to be maintained, especially if the consumption of coke should be reduced by the blowing out of blast-furnaces. Best steam coals are quoted at 11s. 6d. to 12s.; best household at 11s. to 11s. 6d.; and best gas coal at 9s. to 9s. 6d., free on board in the Wear or Tyne. Coke is sold at 10s. 3d. to 12s. 6d. at the ovens, but the tendency of both coal and coke has within the past few days been towards increased firmness. Many collieries continue to work irregularly, and the average of the county is not more than nine days per fortnight.

#### REPORT FROM CORNWALL.

May 24.—There is no indication of any decided movement in the tin standard, and in mining matters generally. Still the position of affairs is decidedly not worse than it was, and inasmuch as the proceedings at the seat of war are apparently becoming more sharp and decisive, we may hope ere long for some relief from the current stagnation. If war is to do any good to the tin market it must be a war carried on with some activity; a prolonged and indecisive conflict is the worst that can happen for all parties concerned. It is to be hoped that something will turn up soon, as there will be other mines sharing the same fate which now threatens Ding Dong. This is one of the oldest mines in Cornwall, but the importation of foreign metal has brought it, after a gallant struggle, to its last days. It is a good mine still, yet continual losses in the end wears out any patience.

The report and proceedings of the Miners' Association of Cornwall and Devon for 1876 (Lake and Co., Falmouth) has just been issued. We have before remarked that considering the amount of funds at its disposal no educational institution in the country, and certainly none which is so thorough in its scientific and technical training, does anything like the useful amount of work that the Miners' Association does. There is ample evidence of this in the positions, at home and abroad, which so many of its students fill, and further testimony to the same fact is afforded by the excellence of the reports issued from time to time. In addition to the reports, &c., and the minutes of the various meetings, there are articles in the present Transactions on the Barrow Rock Drill, Taylor's Drum-Dressing machine, Curtis's Pulveriser, Oxlard and Hocking's Calciner, the salt works at Halle, the Himmelhahn Mine, and on Cornish mining. The income of the Association is quite insufficient to meet its expenditure, for a debit balance of 72s. 17s. 4d. was brought forward to 1876 from 1875, and though, thanks to a legacy from the late Mr. J. E. Vivian, 1876 met its expenditure, there was an adverse balance of liabilities over assets of 126s. 5s. 7d. at the end of the year. Instead of the subscriptions amounting only to 164s. odd, they ought at the lowest to be 250s.

One of the papers mentioned above—that "On the Application of Labour in Cornish Mining," by J. and N. Bryant—deals with a subject especially worthy of consideration at the present time, when there has been so much pressure both upon the working miner and the mine management, when there has been, partially, at least, so much distress among the mining population generally, and such a necessity everywhere to economise the application of labour by making it yield the best results. Messrs. Bryant's suggestion is that there should be actual and constant supervision of the men at work by relays of underground agents or viewers, who would have no surface duties, that each man's time should be kept, and that he should be paid according to the actual number of days worked; that competent men should be encouraged by making them contractors; and that in hard ground, where speed is required, the holes should be set to be drilled at per foot, of course for hand labour. Messrs. Bryant give statistics to show that under this plan, as compared with the old, at least 75 per cent. more speed may be realised, and at considerably less cost. But for full details we must refer to the report itself.

Agriculture is just now conducting an invasion of our mining districts. This week the Devon County Agricultural Association has held its annual exhibition at Tavistock; and early in June the Royal Cornwall Agricultural Association has its annual meeting at Camborne, and certainly, whatever may be said of mining, agriculture appears to flourish. There was a very large show of implements and machinery at Tavistock, including a number of steam-engines; and one engine which merits special mention—Rider's hot-air engine, shown by Messrs. Hayward Tyler and Co. This, the latest form of calorific engines, appears to work admirably. Whether it is adapted for purposes where considerable power is required has yet, we believe, to be proved; but there are many conditions under which—for the production of moderate power—it is use would seem to be more convenient than that of an ordinary engine. It is very simple.

Are any other concerns about to follow the example of South Andurrow, and offer their manager 1s. for every shilling of dividend earned? The idea is not a bad one, but we have not that opinion of Cornish mine managers generally to believe that such a stimulus is needed by them. If a man will not do his best for a mine without such a percentage, he certainly is not likely to do it with; nevertheless, as a bonus on results attained, such a payment is certainly deserved.

The coal question is attracting a good deal of attention again just now in practical circles, thanks, in part at least, to Mr. W. H. Rule's denunciations. It does not follow that he must be right in all his statements; in fact, he is a good deal too sanguine, but anybody who keeps "pegging away" is sure to lead in the end to improvement, if improvement is possible. And so with the controversies which have been waged concerning the best modes of dressing. They can end in nothing but good, for they put everybody on their mettle.

#### REPORT FROM DERBYSHIRE AND YORKSHIRE.

May 24.—Owing to the holidays very little work was done during the first half of the week, but in the present state of the Iron and Coal Trades this has not led to any inconvenience. There has been no change with respect to the furnaces, which go on as usual, for there is no rest for them, so that the production of pig has been kept up to the average. The demand for mill and foundry material has been moderate, whilst the manufacture of Bessemer rails at Driffield has been large. Owing to the pits standing, and the increase in the passenger traffic by excursions, not so much coal has passed along the Midland to the metropolis during the last few days, but stocks having been previously kept prices have remained without any alteration. At Belper, where very many years ago coal was raised to a moderate extent, a colliery has been opened out, which will be the nearest one to the town of Derby, but it is likely that what is raised will be consumed in the locality. At the lead mines business moves along somewhat slowly, and at scarcely any place is there what may be called activity. Wages are low, and the prospects are certainly not very encouraging.

In Sheffield Whitsuntide has been kept much as usual, despite the quietness which has prevailed in so many branches of the trade, and still continues. The war has not improved the state of affairs, for whilst there have been a few orders for steel in consequence, it has caused a marked falling off in the business with the Continent for general goods. The armour-plate mills have been running steadily, whilst there has been a fair output of Bessemer rails. The advent of summer, if such the season can now be called, and the preparations for visitors to the various watering places, has led to a rather better enquiry for the finer sorts of table cutlery, plated forks, &c. Australia, Canada, and India have sent some orders, but there has been no improvement with respect to America. The foundries are not so busy as they have been, and in the neighbourhood of the town some of the establishments are in a worse condition than for a long time past. Very little has been done at the collieries in South Yorkshire during the week, but work was generally resumed on Thursday morning. Many collieries, however, were in full operation on Wednesday. Business with London has been resumed, but the demand is not so brisk as might be expected. From two collieries no Silke-

stone coal is being sent, one of them being closed for the enlarging of the shaft.

On Thursday last the men employed at the Silkstone pit of the Dodworth and Silkstone Colliery Company struck against a proposed alteration in the mode of payment. Hitherto the coal has been sent to bank as it is raised, without riddling, but the manager desired to have the slack sent up separate for the use of the coke ovens, and offered to pay a price within 1d. per ton of what it could be purchased at from an adjoining colliery. This offer was refused, and the men, being supported by the Association, struck.

A subscription for the widow and family of the late Mr. John Normansel was entered into shortly after his death, and a few days ago Mrs. Normansel received the amount, rather more than 150s. The colliery owners, it may be said, were the principal subscribers. Mr. Macdonald, M.P., the friend of the deceased, and who gave an oration over the grave, was applied to for a subscription, but the committee have not yet had a reply to the application.

#### REPORT FROM MONMOUTHSHIRE AND SOUTH WALES.

May 24.—The state of the staple trades has altered but little since last report. There is still a fair amount of business doing, but rates are low, especially for iron rails. For these quotations are exceedingly low, but the demand now compares favourably with what it was a year ago. The principal shipments have been to India, Brazil, and the Baltic ports. The make of pig-iron in the district has increased to a slight extent, but there cannot be said to be any improvement of importance in this particular branch. There is no improvement in the demand for bars.

The aspect of the Tin Plate Trade is truly a very gloomy one. Prices are low, the make having been much in excess of the demand. Masters in the Swansea portion of the district have determined to keep their men at work only two weeks out of three. This takes effect from the beginning of next month, and will continue for the next half-year. It will be remembered the men were working full time at decreased wages, but, even under this regime trade has not been found to pay.

The Coal Trade is but little changed, but there are indications that prices are firmer, and freights to the Mediterranean ports, especially the Eastern, show signs of improvement. The collieries have been working with fair regularity, considering that Whitsuntide has intervened. The coastwise shipments of late must not be taken as a criterion of the exports of house coal, for thousands of tons of steam qualities are now sent to the South of England (Southampton) and other ports for use on board steamers. The question of whether the colliers of the Plymouth and Abernethy Company shall resist the reduction endeavoured to be forced on them by the notice to terminate contracts or not has been debated. Some of the men are in favour of accepting a reduction, while others object doing so.

A correspondent, who has recently visited the Rhondda Valley, says that—"Accompanied by residents in the locality, I spoke with actors and spectators in the late dramatic incident at the Tynwydd Colliery. While there is little probability of all the details of that heroic rescue ever being fitly placed together, still less of praise being apportioned with strict accuracy and justice, all will agree that, among so many whose devotion and gallantry were conspicuous, the brave Isaac Price, the fearless Abraham Dodd (or Todd), and the resolute Gwyllim Thomas stand in the foremost rank. But, while giving honour to whom honour is due, where are the pugnacities of that gallant English gentleman, Mr. Wales, Her Majesty's Inspector of Mines, of whom, thanks to his modest reticence, too little has been heard, but who was the soul of the whole proceeding, and always to be found in the forefront of the struggle, thoughtful for others, but regardless of himself, directing, guiding, encouraging, leading, steadfast in the most imminent peril, accepting with promptitude solemn responsibilities, and directly saving, by his masterly persistence, the lives of the five imprisoned colliers? I have no personal knowledge of Mr. Wales, an attempt to meet him in Swansea having failed; but I have written this much because it seems to me that in justly honouring the collier we run some risk of overlooking the calm heroism of the gentleman."

At a meeting of the delegates of the House Coal Colliers of Monmouthshire and South Wales, at Llanabon, Messrs. John Lewis, Deri, and John Jenkins (Llanabon) have been nominated as members to sit on the Conciliation Board for the next six months.

**IMPORTANT TO THE TIN-PLATE TRADE.**—In the Court of Appeal, before Lord Coleridge, Lord Justice James, and Lord Justice Baggallay, judgment has been given in the case of Flower v. Lloyd.—Lord Coleridge said the object of the suit was to restrain the defendant from the use of a patent claimed by the plaintiffs for impressing designs, colours, and varnishes on the surface of tin and tern plates, so as to make the impressions indelible, by, in fact, incorporating them with the metal so completely that it could be moulded and twisted into any shape without cracking the varnish, or separating the colours in any measure from the tin. Vice-Chancellor Bacon granted the injunction, and the question for this Court to decide was whether his lordship's decision could be sustained. Having minutely explained the process by which designs were impressed on the tin plates, and pointed out the mode pursued by both parties in the suit, his lordship remarked that all that the appellant had done was to arrive at a similar result by a different set of steps, instead of being a patent that had been coloured by a known process was not a thing that could be the subject matter of a patent; yet that was the whole portion of any of the various steps specified by the plaintiffs which was alleged to have been infringed, and upon that ground it appeared to him that the injunction was wrong, and the judgment of the Vice-Chancellor must be reversed.—Lord Justice James was of the same opinion, and for the same reasons. It appeared to him that the Vice-Chancellor fell into a fallacy which he was himself constantly relapsing into in the course of the argument.—But this was in substance a patent for a product, instead of being a patent for an improved process and method of making the product. It might be that the varnishing process was the great merit of the plaintiff's work; but he was satisfied it was never dreamt of by the inventor as an essential part of the process.—Lord Justice Baggallay also concurred, and the bill was dismissed with costs.—The counsel in the case were Sir H. Jackson, Q.C. Mr. Marriott Q.C., and Mr. De Castro for the appellant; and Mr. Kay, Q.C., Mr. Aston, Q.C., and Mr. Macgory for the respondents.

#### REPORT FROM NORTH AND SOUTH STAFFORDSHIRE.

May 24.—The mills and forges of South Staffordshire and East Worcestershire are this week doing but very little. The Whitsuntide holidays will be maintained throughout most of the week at more works than is usual. Some of these are of the first order, with whom it is a rare thing to stop during the whole of a holiday week. At the same time there are instances of a contrary character—instances in which works that almost invariably close throughout the Whitsuntide week recommenced activity last night. But such cases are the exception, and are due more to the desire of the firms to get out of hand as quickly as possible orders which, if delayed, may possibly be countermanded, than to the abundance of specifications on the books. The new enquiries are but few, and relate more to an inferior class of iron, which, as a rule, can be most cheaply obtained from the North of England. The blast-furnaces are kept going, but they are not all on full tapers, and, owing to the suspension of the operations at the mills and forges, stocks, which were large before, are now increasing. Prices neither of pig nor finished iron have strengthened, but generally show a tendency towards weakness, in sympathy with the quotations from other districts. Coal is not being brought up to much extent this week, though a few of the house coal pits are receiving orders that are not usual at this time of the year, the result, it is assumed, of the continued cold weather. Nevertheless, even at the household pits, the aggregate of the business doing is trifling.

Mr. Thos. Halliday and two local Union officers had a conference yesterday with Messrs. J. Sparrow and D. Groucutt, which will facilitate an early general arrangement relative to hours and wages.

On the same day, in the same town, the creditors of the Darlaston Steel and Iron Company, acting upon the advice of the Investigation Committee, accepted in discharge of their claims fully paid-up shares in the new company, redeemable upon payment by the directors of the old company of 2s. 6d. in cash and 2s. 6d. in debentures; but the Sheepbridge Coal and Iron Company and the Darwin Coal and Iron Company, who are creditors, declared that they will oppose any private arrangement, even though they should appear in Chancery, unaided by other creditors to overturn recent mortgages, which the committee declared could be overturned.

A new firm, styled Harrison, Hipkins, and Harrison, have re-



started the Ironworks at Walsall, of the late Edward Russell, which have been long standing.

The water continues to rise in the collieries in the Bilston district. No. 10 pit, in Messrs. Thorneycroft's Lower Bradley Colliery, is now closed through the inability of the firm to keep down the rising water by the apparatus available, which is a tank in No. 9 shaft. The same firm are also stopping two of their other pits from the same cause, the water having risen above the new mine coal. The horses and the working plant have been drawn up, and there seems little prospect of the works being re-opened. Messrs. Thorneycroft have likewise stopped one of their stone pits in the same locality, in that case because the miners have come upon a fault in the Robins ironstone measure.

Some little movement is taking place in the local exchanges. The 10% shares of the Sandwell Park Colliery have changed hands at 9% premium, though most sellers hold off for another 20s. The shares of John Bagnall and Sons (Limited) have been sold at 37. 5s., but holders quote two additional half-crowns as their price; 3% prem. has secured the 10% (5% 10s. paid) shares of Muntz's Metal Company, and sellers now demand one-eighth more. The 20% (14% paid) shares of the Patent Nut and Bolt Company have changed hands at 7½ prem. The shares of the Birmingham Wagon Company (Limited) have just sold at 20%, or double their original value. Speculation is also going on in the property of the Birmingham Small Arms Company, which has been bought at 9½ prem., only three days previously having obtained 10% prem. The other colliery and ironworks shares remain as last quoted.

Eleven mining prosecutions instituted by the district Government Inspector against persons in connection with the Moat Colliery, Tipton, including the manager, have been adjourned by the Sedgley Magistrates until a legal point raised for the defence has been decided by a London counsel.

Last week closed in North Staffordshire with more activity at the mills and forges than has been seen for some time past. This was due not, however, to any considerable accession of new orders, but to the wish of men and masters alike to get as much work out of hand as possible before the Whitsuntide holidays began. This week there is up to date scarcely any movement. The stocks of pigs at the furnaces is increasing, and the supply of coal and pottery mine is far in excess of demand.

**LARGEST ROPE EVER MADE.**—A letter from Birmingham says:—"Strictly speaking there is but one of the leading industries of the 'hardware village' really busy—the manufacture of wire-ropes, the monopoly of which in Birmingham is possessed by Messrs. J. and E. Wright, of the Universe Works, a firm giving employment to upwards of 1000 hands, and who, with two sets of men, are now working day and night on extensive orders for home and export, particularly France. It may be interesting to hear that the largest rope on record has just been completed at the branch works of the firm, Millwall, London. The rope is 15 miles long, one continuous length, 6½ in. in circumference, and weighs nearly 30 tons, while the material is best white Manila hemp, prepared by patented machinery, and bearing a strain of 20 tons 12 cwt. The rope has been manufactured by the Telegraph Construction and Maintenance Company, and is to be used in the attempt to recover the 1865 Atlantic Cable. The prices of Russian hemp and flax have already advanced, owing to the war, and it was not considered probable that for some time to come the course will be in a downward direction. Though the wire and hemp rope trade of the country is generally reported as extremely dull, Birmingham is a most favourable exception, the orders and contracts on hand being already sufficient to keep the men fully employed for many months hence; amongst the contracts just entered by the Birmingham house is one to supply ropes, cordage, &c., for the London and North Western Railway for the ensuing twelve months."

#### TRADE OF THE TYNE AND WEAR.

May 23.—Very considerable business has been done in the Coal and Coke Trades, and shipments have been large of house, steam, and gas coals. The cold season keeps up the demand for house coal, and the steam coal trade has rather improved, while the falling off in the gas coal trade has not been serious as yet. The returns of mineral traffic on the North-Eastern Railway show a large increase for the last month, as compared with the same period last year, and shipping is now well employed, so far as outward freights are concerned, but return freights are not so favourable, owing mainly to the war in the East, which has for the time shut up the Black Sea and the Danube.

In passing through the whole of the Northumberland colliery district on Saturday there were many indications to be observed of the coming struggle which is confidently expected by all parties; most of the collieries have been regularly worked lately, and coals are being laid up to supply the pumping-engines during the expected strike. Unless some compromise is effected speedily the men will certainly come out almost to a man. They would agree to refer the proposed reduction of wages to arbitration if the masters would allow the question of free house and coal to remain in abeyance for a time; the only question, therefore, is whether the masters will make this concession, and thus avoid their works being stopped for an indefinite period, for if a strike occurs it is likely to continue at least six months. The number of miners in Northumberland are comparatively small, about 15,000 may be taken as the gross number; many of them have resources, and those who have not will be well supported by other Trades Unions.

The preparations for commencing the sinking of the shafts at the Whitburn new winning on the Belgian system are nearly completed, and the operations will be commenced very shortly. All arrangements are about completed, but the arrival of some of the tools are waited for; the operations will, of course, be watched with the greatest interest.

In Cumberland the coal trade is in a worse state than it is on the Tyne, and the masters are in consequence of this reducing the rate of wages.

Mr. Bin, owner of the Harrington Colliery, has lately attempted to make a reduction of 10 per cent. in the wages of his men, but they have resisted this, and come out on strike.

There is nothing more remarkable in the history of the coal trade of this great district than the rapid extension and increase which has been constantly going on, not only in the number of collieries but also in the extent of the works, and the quantity of mineral put out in a given time. The average annual output of the collieries in the great northern coal field in 1855 was only 56,525 tons per colliery, but in 1875 the average had increased to 74,118 for Northumberland and North Durham, and 109,822 tons per colliery for South Durham. Evidently, therefore, the tendency of the last 20 years has been to increase the output of coal from the number of collieries already at work rather than that of bringing an unlimited number of small pits into the field. In 1819 there were in the great northern coal field 31 set-sole collieries, producing an aggregate of 3,532,450 tons, being an average of 109,897 tons per colliery, while at the same time 35 land-sale collieries produced altogether 389,660 tons of coal, being an average of only 11,136 tons per colliery. Altogether, therefore, there were 66 collieries at work in the great northern coal field in 1819, producing an aggregate of about 3,921,000 tons of coal, as compared with 427 collieries, producing about 31,000,000 tons of coal at the present time. We have, therefore, increased the output from each colliery at a more rapid rate than the number of works.

At the Camb. Colliery, in Northumberland, upwards of 2000 tons of coal per day has been drawn from one shaft; the depth is about 90 fms. From 800 to 1100 tons per day is in many cases got, and at Ryhope and other places in Durham upwards of 2000 tons per day is got from two deep shafts up to 200 fms. in depth.

The utilisation of the waste slag, which accumulates in enormous quantities in our iron fields, has long occupied the attention of the smelters and others. In some cases this slag has been used in forming piers and breakwaters, in making bricks, and lately in making glass. Arrangements have now been made at Jarrow to convert the waste slag into material for making roads of all kinds, garden walks, &c. A steam slag machine has been constructed by Mr. Archer, of Dunster, and it has been erected by Messrs. Vaughan and Co., who have contracted with Messrs. Palmer for the slag produced, and they will convert it into material for road making, for making concrete, &c. The machine weighs 11 tons, and it will convert and crush 80 tons per day. For road-making the slag is broken into cubical pieces, and it will without doubt prove a great competitor

against the ordinary whinstone used for road-making, as it can be supplied at a much cheaper rate, and in any quantity.

The Iron Trade has been extremely quiet, and partly owing to the holidays many of the works have been closed. The lock-out of the shipbuilders on the Clyde will have a bad effect on the plate trade if it continues for any lengthened period. There is no change to notice of consequence in the quotation either for pig-iron or finished bars or plates.

There is an improvement in the demand for chemicals, some good orders having been received from America, and shipments have been large for that quarter. No change of consequence in current rates, but a better feeling in the trade generally.

#### REPORT FROM THE FOREST OF DEAN.

May 24.—A fortnight ago, in reporting the arrangement agreed upon at Crump Meadow Colliery for a further reduction of wages, in order to enable the managing director to undersell the other collieries in a ton, on the ground that much of the remaining coal in Crump Meadow seams (or measures) is of a nesh (or soft) consistence (comparatively), we stated that it was stipulated the arrangement should not affect or prejudice wages elsewhere. It was on that distinct understanding that the Crump Meadow men accepted the reduction, with a view to mutual benefit—i.e., to enable the business manager and managing director to sell cheaper and win increased trade, and the men thereby gain more regular and increased work or employment. Some of the more thoughtful workmen at the time expressed their doubts as to the arrangement being practically, as well as verbally, accepted as unique in the Forest, and in less than a week afterwards their fears were verified by the Messrs. Brain attempting to introduce further reduction, pleading Crump Meadow reduction as a reason, and further urging what was no doubt true—that merchants had asked for lower terms with them because a reduction had been made in price at Crump Meadow. But the cases are not parallel. Trafalgar pit yields splendid hard black coal entitled to the top market price, whereas the coal at Crump Meadow, though good, is a good deal of it of a nesh quality, which gives it less chance in the market; therefore, for Trafalgar to draw conclusions from Crump Meadow arrangement was preposterous. Quality is one of the things which renders difference in price legitimate in all other trades, and why should the coal trade prove an exception? When persons apply for best articles at shops at the prices charged for poor or inferior goods the difference is explained to them. They are told that if they want a good article they must give the current price for the quality or make. And the Messrs. Brain should have explained to their customers the absurdity of expecting a superior article for one of less hardness, and, therefore, with less chance in the market; and the merchants, whatever they might urge for business purposes, would have at once felt that their pleas were not founded on justice.

It is very important that prominent men of business should be straightforward in their transactions, as crooked ways are calculated to destroy faith in another. The Chairman either had the sanction of the other proprietors to pledge their honour in connection with Crump Meadow arrangement, or he had not. If he had not he had no right to pledge it; but if he had, as was assumed and understood, they ought to honourably abide by it. Double dealing and misrepresentation should be altogether discarded from commercial and wage contracts, so that when more persons may be believed and trusted as persons of truthfulness and honour. The suspicions created by attempts of the kind now referred to undermine confidence and damage men's characters, and we do hope that henceforth frankness and integrity will characterise the intercourse of employers and employees, so that mutual respect and confidence may still dwell in the old Forest of Dean.

The trades—coal and iron—are both still very dull, and employment very irregular, and we regret that the right turn should have been interrupted at Trafalgar, as we hope there was no positive necessity for it; though, of course, the proprietors in that case are the best judges. Other trades are also still in a sluggish condition, and workpeople having only little work feel the effects very much in their families; many, indeed, are partly famishing, seeking by precarious means food to support nature, numbers pawning their cloths and other articles for the purpose. Nor do we see any reason to look for much revival for some time to come; and, in fact, we believe that our greatest employer of labour, Mr. Henry Crawshaw, is correct in his anticipations—that England will never again rise to the industrial pre-eminence of the past. By the excessive cost of labour, and the high prices of a few years ago, gave advantage to foreign countries to start in the same lines of business, of which they availed themselves, and having once got a start and a standing there is not now the same extent of market scope for England as there was formerly, though we believe that to some extent England will rise again in her industries.

#### PREVENTION OF CORROSION OF IRON.

Confidence in iron as a material to be applied in construction has been so severely shaken of late that some such invention as that of Prof. BARFF, of the Kensington Catholic University College, brought before the Society of Arts some three months since, was absolutely required to prevent its going out of use for such purposes altogether, so that iron manufacturers may well desire the success of his discovery to be established. His invention can be explained in a few words—he converts the surface of the metal into magnetic oxide of iron, which is a very stable compound, capable of protecting the iron from all further change. The failure of the various processes for preventing steam-boiler incrustation suggested to him that if the particles of black oxide of iron formed in the position of the original particles of iron could be rendered coherent with one another, and adherent to the iron surface, the object would be effected. Prof. Barff has proved by experiment that this can be done, and that "the oxidised surface of the iron resists, for a long time, and more effectively, the rubbing with emery paper than does the simple metallic iron itself, and there is a very manifest difference between the ease with which a sharp rasp is able to cut away the surface of the iron, and the difficulty with which this black oxide is removed from the surface by the same instrument;" and he has proved "that a flat rasp does not at all affect the surface of iron coated at 1200° Fahr."

The method which he finds best for effecting this surface oxidation is "to raise the temperature of the articles to be treated in a suitable chamber—say, to 500° Fahr.—and then to pass the steam from a suitable generator into this chamber, keeping the articles for five, six, or seven hours, as the case may be, at that temperature, in an atmosphere of superheated steam. Differences of temperature are employed where different objects are to be obtained. If it be wished to act upon surfaces of polished iron or steel it is desirable to let the temperature remain at 500° Fahr. until the operation is completed. Articles coated in this way will not resist the action of continued moisture such as has prevailed for several months when exposed out of doors; but they will resist the action of any amount of moisture with which they may come in contact in a house or building—and the reason of this will be very obvious, because only a thin film of the iron, on its surface, is transformed into the black oxide. At a temperature of 1200° Fahr. and under an exposure to superheated steam for six or seven hours the iron surface becomes so changed that it will stand the action of water for any length of time, even if that water be impregnated with the acid fumes of the laboratory."

The purposes to which Prof. Barff considers his magneto-oxidised iron would be applicable are very numerous—water mains and indoor water-pipes (the latter replacing lead), saucapans, and architectural decorations being among the number. He claims that he can treat iron in such a way that it will never rust. Of course, if the process will answer for architectural ornaments it will answer for statues, so that iron may be used instead of bronze, which will materially lessen the cost of casting statues, both in the material and in the expense of making the moulds. It is unnecessary to enumerate its various applications for the preservation of iron, for it appears that they would be commensurate with most of the uses to which iron is applied, save and except those where friction—such as that to which rails and iron wheels are exposed—would necessarily wear away the coating, as they wear away the material itself. The cost of coating the articles is said to be very trifling.

In the discussion which followed the reading of the paper the invention was very highly spoken of by Admiral Selwyn, who remarked that in considering this magnetic oxide they could not do better than look to what Nature taught them of its properties. In New Zealand you could find any quantity of this substance, which had remained totally unchanged even by the action of salt water during all the centuries which had elapsed since the creation of the world. There was already some experience of the lower form of this process, for Mr. Perkins, in his steam boilers, pressed the steam up to about 450 lbs. on the square inch, and his tubes had been found after thirteen years use not to have undergone any change of the slightest description. They had an imperfect coating of magnetic oxide of iron upon them; but Mr. Perkins, while he knew that they had not decayed, was not aware of the reason, which Prof. Barff had so ably brought before them. He had no doubt that in the future this invention would be largely used, and would be introduced into structures which now became quite unsafe in the course of a few years from the tendency to rust and decay, which had never yet been overcome. The importance of the invention for

application to mining pumps used for raising water from copper mines and mines containing iron pyrites was pointed out by Dr. Le Neve Foster, and Dr. Graham explained that the great invention of *situ* without disturbance of the molecular arrangement.

In replying to the various observations made Prof. Barff said "that if this process was classed with other processes for coating iron a coat of paint would last for twelve months, but if that was scraped off anywhere, and oxidation took place, it would rapidly spread underneath, and throw off the paint. This was not the case with his process, for some of the specimens showed (where the coating had been removed) that the oxidation was localised, and had not spread in any direction. The only point to be considered in reference to its durability was whether the oxide adhered perfectly to the iron, and that had been vouched for, because every cloth would not touch it. Admiral Selwyn had called attention to the fact of the sea-shore being covered with magnetic oxide, which did not rust; and some of his own specimens had been exposed to the action of salt water, and others to water charged with the acid vapours of the laboratory. In answer to Mr. Penrose, he could not see how the strength of the iron could be affected, as it was never raised to a white heat, and only a film of the surface was affected, but it would be easy, if necessary, to add so much to the thickness of the iron, which had to bear a strain. The temperature could not affect it, because the metal had previously been welded or worked at a much higher temperature, and there was no contact with the steam lower than the oxidised surface."

**THE ALMADA AND TIRITO MINES.**—We are informed by the London manager of the Almada and Trito Company that the specimens of ores and country rock referred to in Mr. Breach's late letter, published in last week's Journal, have arrived at the London office of the company, Finsbury-circus, and that any shareholders, or persons feeling an interest in silver mining generally, can see them on applying at the office. The specimens are from the Trito, San José, Lode, and Dios Padre, and may be described as follows:—1. From the Trito, argilliferous copper ore; clay selvage from the Trito, consisting of decomposed felspar; and country rock to the west of the lode, which may be described as basaltic greenstone. 2. From the New East Lode, consisting of argilliferous copper ore. 3. From five different points of the Dios Padre Mine at the tunnel level, consisting of argilliferous copper ore, rich pitauque, and rich silver-lead ore; a specimen has also been sent of the country rock west of the Dios Padre Lode, which is very similar to the country rock west of the Trito, but containing more iron. The country rock in both cases may be described as "basic," rather than "acid," and consequently favourable to the production of silver and copper ores. To any gentlemen interested in the working of silver mines either on the Pacific Slope or in Mexico, the above specimens would prove especially interesting and instructive.

**POLLUTION OF RIVERS.**—Mr. Frank Buckland and all true lovers of the "gentle craft" will be pleased to hear that a most successful effort to cleanse the water used in dressing lead ores has been made at the Monydd Gorrdu Mine, near Aberystwith, where, by a very simple and inexpensive system of pits and ponds, the water passes from the mine into the stream pure and perfectly innocuous to fish and flesh. We sincerely hope such an admirable example will be speedily followed by other mines:—

Mr. David Jones, the inspector, says that—"I also acquainted, in writing, the agent of the new lead mine at Lletty-ben in the township of Tynmawr, the decision of the board in the event of the Brogryn stream being polluted by washing at the mine—namely, that the company will do so at the expense of the mine. I also found that the River Caeilan is being polluted by operations at the Allt-y-crib and the Blaencalan Mines. On inspection, I found that such is the case. I also found that the River Lery is occasionally polluted in the same way at the Llawn-cwm-bach Mine, in the township of Eberch. Before leaving this matter, it may not be out of place to state that commendable efforts with apparent success are made already at Monydd Gorrdu, in order to purify the polluted water before leaving the spot, by means of a series of pits and ponds. The water finally leaves as clear as from any ordinary fish-pond, and does not seem to injure the quality of the stream it flows into."—*Camden News*, May 18.

**THE COMSTOCK MINES.**—The principal mines on the Comstock lode are in Storey county. The laws of Nevada call for quarterly returns of the bullion product for the purpose of assessment. These returns cover the number of tons of ore extracted and the gross amount of bullion produced from the same. For the quarter ending Dec. 31 the figures are as follows:—

Mine	Tons	Price per ton	Total
Belcher	20,400	\$16	\$326,400
California	44,400	83	3,700,000
Consolidated Virginia	30,200	95	2,870,000
Crown Point	2,500	11	27,500
Chollar Potosi	10,200	19	193,800
Justice	22,500	23	517,500
Ophir	17,400	24	417,600
Totals	118,000	\$50	\$5,900,000

For the previous quarter the product of the above mines, with 1900 tons added for Consolidated Imperial and Overman, was 147,400 tons, averaging \$39 per ton, and producing \$5,742,000 in bullion. During that quarter the ore taken from the bonanza mines averaged \$97 per ton.—*San Francisco Stock Report*.

LEAD ORES.					
Date.	Mines.	Tons.	Price per ton.	Purchasers.	
May 16—Great Dyllite.	60	£14 0 0	Walker, Parker, and Co.		
2—Great Laxey.	100	22 13 6	Adam Eytton.		
24—Kingston Consols.	8	17 6 0	Burdon, Bush, and Co.		
—ditto	5	12 1 0	Nevill, Druse, and Co.		
—Do Broke.	5	13 13 0	ditto		
—West Tankerville.	35	13 17 6	G. Barr.		

BLENDE.					
Date.	Mines.	Tons.	Price per ton.	Purchasers.	
May 24—West Tankerville.	20	£4 10 6	Dillwyn and Co.		

BLACK TIN.					
Date.	Mines.	Tons c. q. lb.	Price per ton.	Amount.	Purchasers.
May 19—W. Wheel Eliza.	9	4 1 8	£41 5 0	330	3 3—
—Pedin area.	9	15 2 16	—	424	14 2—
—West Godolphin.	15	15 3 1	40 7 6	677	16 0—Bollito.

**CENTENARY MEETING OF THE BATH AND WEST OF ENGLAND SOCIETY,**  
JUNE 4 TO 8. STAND 90—SHED 3.  
**CAMBORNE MEETING OF THE ROYAL CORNWALL SOCIETY,**  
JUNE 12 TO 16.

**H. R. MARSDEN WILL EXHIBIT IN FULL OPERATION**  
"BLAKES" PATENT STONE BREAKERS.

All parties interested are invited to send their own material to be operated upon.

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REFERENCES.  
In England—The London Mining Journal, and leading Cornishmen.  
In California—The Mining and Scientific Press, and principal Miners & Bankers.







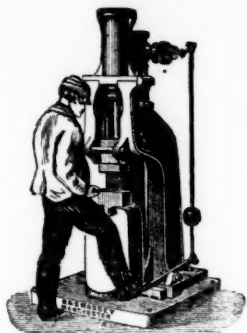
# B. & S. MASSEY, OPENSHAW, MANCHESTER.

Prize Medals—Paris, 1867; Havre, 1868; Highland Society, 1870; Liverpool, 1871; Moscow, 1872; Vienna, 1873; Scientific Industry Society, 1875; Leeds, 1875; Paris, 1875; Manchester and Liverpool Society, 1876; U.S. Centennial, Philadelphia, 1876.

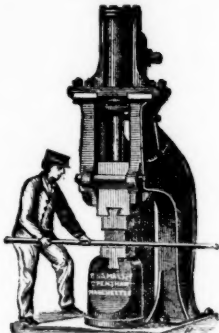
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## STEAM HAMMERS

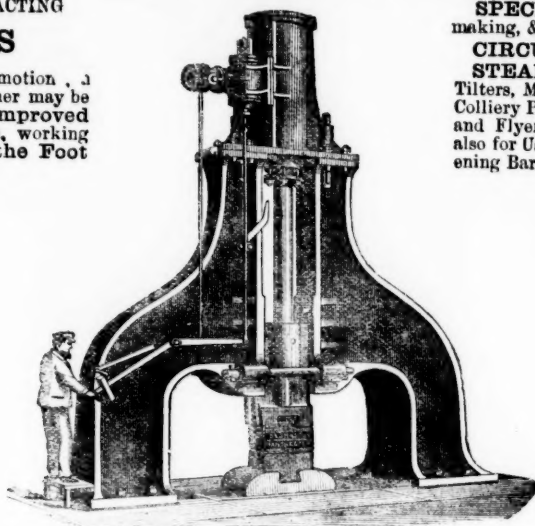
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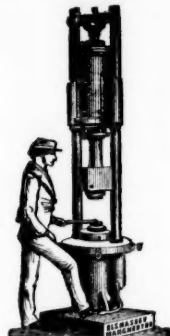
Small Hammer with Foot Motion.



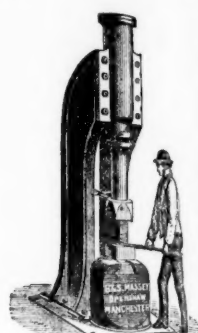
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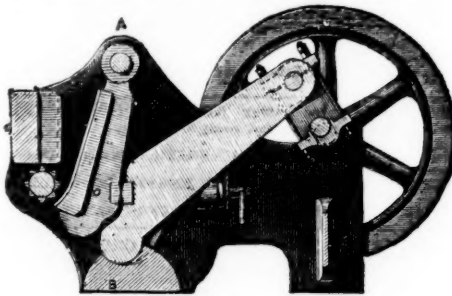
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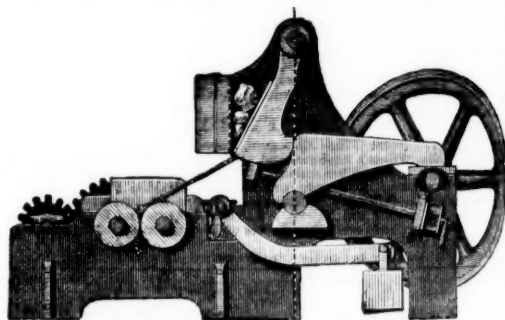


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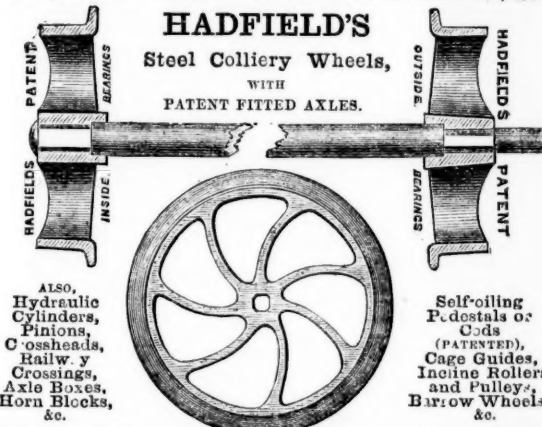
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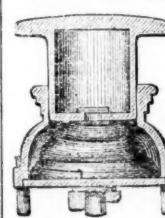
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20 Great Northern .....	10	0 0. 7 1/2
15 Mediterranean .....	10	0 0. 7 1/2
25 Indo-European .....	10	0 0. 2 1/2
8 Reuters .....	8	0 0. 11 1/2
Stk. Submarine .....	100	0 0. 00 00
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Stk. Cent. of New Jersey Con. Mort. ....	100	0 00.	135
Stk. Cent. Pacific of Calif., 1st Mort. p.c. ....	100	0 00.	135
25 City of London Real Property [L.] .....	12	0 00.	0
25 Copper Miners of Eng. (7 p.c. pref.) .....	25	0 00.	14
5 Credit Foncier of England [L.] .....	5	0 00.	14
5 Diamond Rock Boring .....	4	10 00.	15
15 English and Foreign Credit .....	5	0 00.	0
18 Fore Street Warehouse [L.] .....	14	10 00.	12
15 Foster, Porter, and Co. [L.] .....	10	0 00.	1 1/2
5 Gen. Phos. & Chem. Works Co. [L.] .....	1	0 00.	0
10 Glasgow & Winton Quay .....	1	0 00.	0
1 Greenhill [L.] .....	1	0 00.	0
17 Hudson's Bay Company .....	17	0 00.	13 1/2
10 Huntington Copper and Sul. Co. ....	9	0 00.	45
Stk. Illinois Central, 8100 shares .....	100	0 00.	45
Stk. Illinois & St. Louis Bridge, 1st Mort. ....	100	0 00.	45
Stk. Ditto, 2nd Mort., 7 per cent. ....	100	0 00.	21
Stk. Illinois Cent. Sinking Fund, 5 p. cent. ....	100	0 00.	100
Stk. Ditto, 6 per cent. Preference .....	7	10 00.	0
1 1/2 Ditto, Surplus Certificate .....	—	—	6 1/2
Stk. Leigh Val. Con. Mort., A, 6 p. cent. ....	100	0 00.	9 1/2
10 Miner's Safe [L.] .....	10	0 00.	9 1/2
25 National Discount [L.] .....	5	0 00.	4
Stk. N. Cent. Rail. Con. Mort., 6 per cent. ....	5	0 00.	45
5 Patent Gunpowder Company .....	6	0 00.	35
5 Paces and Paces .....	50	0 00.	35
5 Peninsular and Oriental Steam .....	50	0 00.	100 1/2
Stk. Penny-l. Gen. Mort. 6 p. cent., 1910. ....	100	0 00.	94
Stk. Ditto, Con. Sink. Fund, 6 p. c., 1905 ....	100	0 00.	175
Stk. Scottish Aust. Investment Company. ....	100	0 00.	0
Stk. Ditto, 6 per cent. Preference .....	20	0 00.	0
10 Silver Light (ord. sh.) .....	20	0 00.	25
20 Suzel Canal shares .....	12	0 00.	25
12 Telegraph .....	8	0 00.	2 1/2
10 Tharsis Sulphur and Copper Co. ....	10	0 00.	20 1/2
Stk. Union Pacific Land Grant, 1st Mort. ....	100	0 00.	97
Stk. Union Pacific Railway, 1st Mort. ....	100	0 00.	100

\* Limited Liability Companies; † quoted on the Stock Exchange; I have paid dividends.